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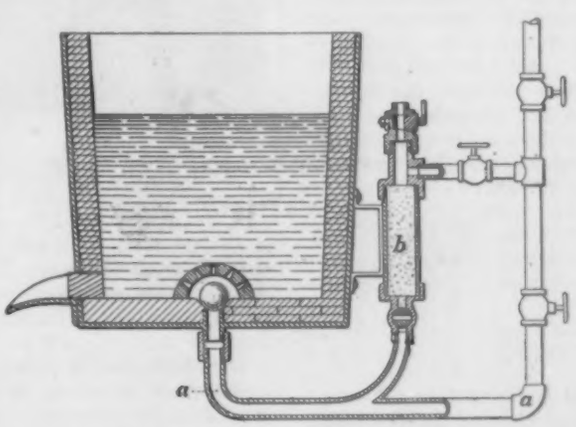
Removing Sulphur from Molten Cast Iron

A Method of Introducing Compressed Air into the Metal in the Ladle — A Treatment of Hard Iron Which Results in Soft Castings

A patent has been granted to W. F. Prince, foundry superintendent, the Henry R. Worthington Company, Harrison, N. J., on a process for removing sulphur from molten cast iron. It is both novel and simple and also metallurgically interesting. The patentee claims to be able to reduce the sulphur content by 30 to 50 per cent. and has accomplished this in numerous instances. Sulphur is the *bête noire* of the iron foundryman. Any process by which the content can be kept down has special commercial and metallurgical value. Many castings have been lost because of the presence of defective spots of various sizes, attributed in many cases to kish, sand, or oxide.

It occurred to Mr. Prince to have some of these spots analyzed. He found them almost invariably high in sulphur, as also in manganese and silicon, while the normal iron of that part of the casting was lower in sulphur and manganese than the average for the casting. If the original surrounding normal iron contained silicon, 2.50 per cent.; sulphur, 0.050 to 0.080 per cent., and manganese, 0.70 to 0.90 per cent., then the composition of these spots was often found to approximate silicon, 3.75 per cent.; sulphur, 0.40 to 0.60 per cent., and manganese 1 to 2 per cent. This was thought to indicate the presence of large amounts of sulphide of manganese, the high percentages of sulphur and manganese being decidedly abnormal and surprising.



Apparatus for Treating Molten Iron with Air to Remove Sulphur

Experiments Leading to the Invention

The next step in the patentee's discovery was an attempt to reproduce, under commercial conditions, this unusual chemical compound or compounds. Success attended these efforts more easily than was at first expected, though Mr. Prince suspected the cause. He believed that these agglomerations of material, high in manganese and sulphur, did not exist in the original iron but that they were formed during pouring and usually in the mold itself. Being thus formed, the agglomerations floated along the walls of the mold until fastened there by the pressure and solidifying of the molten iron. The cause of the formation he ascribed to the ebullition of gas or steam through the iron, set free from the molds or cores by the temperature and pressure of the liquid hot iron, a reaction taking place altogether too often. Acting on these surmises Mr. Prince performed some experiments. He took a ladle holding 1000 lb. and to the bottom, through a small hole, attached a pipe with a hole 1/16 in. in diameter, connected to an air system of 90 lb. pressure. Into this ladle the metal was tapped from the cupola. In each experiment at the end of 10 to 20 min. of the gentle ebullition caused by the air a scum or slag was floating on top. Analyses of this slag showed it to be a compound entirely similar in composition to those forming the defects in castings. The results of eight different experiments of this nature are shown in the table on the following page.

These trials were so successful that Mr. Prince experimented with different irons under different conditions with equally satisfactory results; so much so that a large tank was installed, equipped with the same convenient air connections. Castings made from iron thus treated showed a reduction of 25 to 50 per cent. in the sulphur contents and in each case the iron was clean, sound and easily machined. The physical properties also had not been sacrificed. While exhaustive tests have not been made to determine just how much sulphur can be eliminated, it is the opinion of Mr. Prince that it all depends on the amount of manganese present or added. In the hundreds of tests made the results, it is stated, have always been of the same sort. In each case the high sulphur has been lowered decidedly, passing off into the newly formed slag. The original iron has lost some of its manganese, but this can be avoided by adding powdered ferromanganese to the stream of air. Other alloys, as well as carbon, for increasing the temperature, can be injected also.

The Apparatus Employed

The apparatus used and patented by Mr. Prince is shown in the illustration. Ordinary compressed air is admitted through the pipe *a* into the bottom of the ladle. The cylinder *b* is used for holding the powdered alloys that it may be desired to inject into the metal with the air. The entire mechanism is attached to the ladle so that the reaction can take place as soon as the metal strikes the ladle and while it is being transported some distance to the molds. The reaction which it is claimed takes place as the "air, gas or steam or other equivalent" comes into contact with the molten metal is that it oxidizes the manganese, creating manganese oxide, which, owing to its affinity, unites with the sulphur to produce a slag which rises to the top of the ladle or reservoir, where it may be skimmed off. During this operation a small quantity of the manganese unites chemically with the sulphur to form manganese sulphide, which rises to the top after it is formed by the agitation produced by the oxidizing agent.

Table of Experiments

	Silicon, per cent.	Sulphur, per cent.	Manganese, per cent.
Experiment 1			
Molten iron	2.55	0.051	0.72
Treated	2.53	0.035	0.52
Slag formed on top	3.65	0.429	2.16
Experiment 2			
Molten iron	....	0.099	0.46
Treated 2½ min.	....	0.099	0.49
Treated 4½ min.	....	0.099	0.45
Treated 5½ min.	....	0.096	0.45
Treated 7½ min.	....	0.092	0.41
Treated 9½ min.	....	0.090	0.42
Treated 18 min.	....	0.065	0.31
Experiment 3			
Molten iron	2.10	0.096	0.42
Treated 2½ min.	....	0.085	0.39
Experiment 4			
Molten iron	....	0.095	....
Treated	....	0.075	....
Experiment 5			
Molten iron	2.25	0.103	0.57
Treated	2.18	0.079	0.42
Treated	....	0.071	0.36
Slag formed on top	....	0.570	1.12
Experiment 6			
Molten iron	....	0.074	....
Treated, first part	....	0.042	....
Treated, last part	....	0.033	....
Experiment 7			
Molten iron	....	0.078	....
Treated, first part	....	0.042	....
Treated, last part	....	0.033	....
Experiment 8			
Molten iron	....	0.070	....
Treated	....	0.056	....

Converting Hard Iron into Soft

The disposition of high sulphur iron with its consequent high combined carbon is always attended with difficulties. In quantities it is practically non-usable for remelting. But Mr. Prince has found some surprising results from an application of his process to such iron. A quantity of high-sulphur borings was melted in the cupola, tapped into an experimental ladle and treated. The iron that was produced was a high grade soft iron having all the properties of a regular foundry iron. The analyses before and after treating were as follows:

	Untreated, per cent.	Treated, per cent.
Silicon	1.02	2.05
Sulphur	0.129	0.089
Phosphorus	0.69	0.66
Manganese	0.36	0.44
Total carbon	2.36	2.43
Graphitic carbon	0.00	2.01
Combined carbon	2.36	0.42

In this experiment the sulphur is reduced 30 per cent. and the carbon has been nearly all changed to graphitic. Both ferrosilicon and ferromanganese were added during treating. It is believed that this opens up great possibilities for it is claimed that not only can such impure iron be reclaimed but that even other irons high in sulphur can be used.

Compared with the Bessemer Process

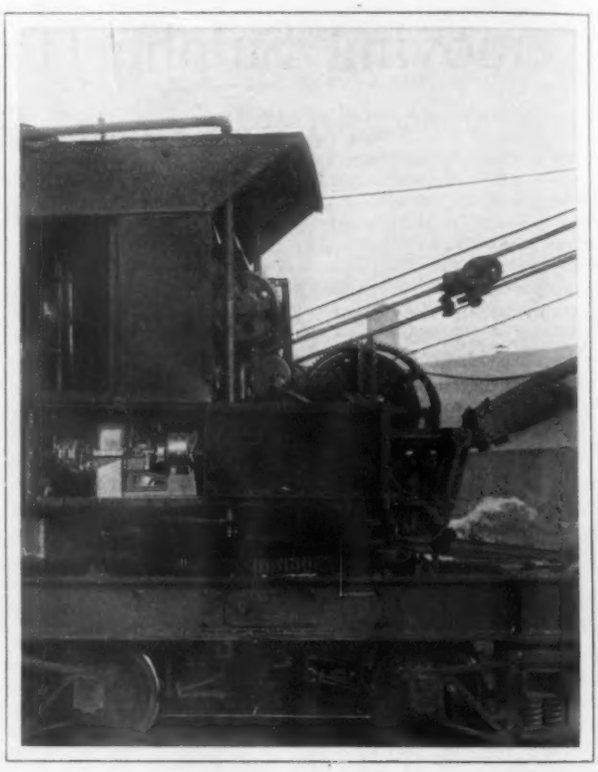
When application was made for the patent, the objection was at first made that it was an infringement of the Bessemer process. In the latter, however, the temperature increases greatly, due to the oxidation of the carbon and the silicon by the air blast; in the new process there is a gradual decrease in the temperature of the molten metal, inasmuch as there is no oxidation of the carbon or silicon, or practically none.

It is claimed that the method can be used in connection with blast furnace work, making pig iron in the usual way, drawing it into a receiver or ladle, treating it as above described and then casting it into pigs, and that it is capable of use in all iron or steel foundries. It has been found of great advantage by the patentee in making large cylinders and pipe and heavy machine castings, increasing the factor of safety by preventing the formation of kish, etc., in the mold.

Locomotive Crane with Lifting Magnet

How a Self-Contained Unit Was Obtained by Including a Steam Turbo-Generator Set

With the view to eliminating the necessity for dragging power wires along the track on which travels a locomotive crane equipped with lifting magnets, experiments have been made in the fitting of such cranes with small electric generating sets driven by steam turbines. One of the most recent applications is the use of a 5-kw. turbo-generator set, built by the Terry Steam Turbine Company, Hartford, Conn., to a 15-ton locomotive crane built by the Brown Hoisting Machinery Company, Cleveland, Ohio. The magnet, energized by the current from this unit, is used



A 15-Ton Locomotive Crane Equipped with a Turbo-Generator Set for Energizing the Magnet Employed for Handling Pig Iron and Scrap

for handling pig iron and scrap at any point within the reach of its 40-ft. boom. The crane is moved by a reciprocating steam engine in the usual way, and the swinging and elevation of the boom are taken care of in a similar manner.

The small generator set, which is entirely independent of the other operating mechanism, is mounted, as illustrated, in a compartment beneath the floor of the operator's cab, where it is entirely out of the way. It is stated that full power can be obtained in less than 1 min., and aside from an occasional oiling the turbine requires no attention. Care is taken to secure accurate balancing of the rotating parts to eliminate vibration, so that a small, light and inexpensive base, bolted rigidly to the crane, suffices. The whole set is located in a pocket or shelf, as indicated, entirely out of the way, but it is accessible by means of a large door to the compartment.

Adding Vanadium to Muck Iron.—A patent (1,079,129) has been granted to John Kirby, Pittsburgh, on a process for introducing vanadium into muck bar to increase its tensile strength. A composition containing vanadium oxide with a reducing agent and an agent to increase the combustion of the reducing agent, so as to reduce the vanadium and thoroughly incorporate it in the iron, is fed into a heat of muck iron in a puddling furnace about the time the cinder is boiled off and before the iron is ready to ball. The composition may contain vanadium oxide, 32 parts; aluminum, 8 to 16 parts; iron rust, 8 parts; potassium chlorate, 2 parts; black oxide of manganese, 1 part and barium dioxide, 1 part.

Steam Generator for Gas Producers

Construction and Operation of a German Device Which Is Economical and Convenient

Many gas producer plants have labored under one great disadvantage: If they used steam they were dependent in many cases on a boiler plant situated at a considerable distance from the producers. Under such circumstances not only was considerable expense incurred in unnecessarily firing the boilers when the rest of the shop was idle, but there was heavy loss from condensation in conducting steam a long distance. Georg Hannack, in Stahl und Eisen for October 16, describes an apparatus put on the market by Bender and Främbs, of Hagen, in Westphalia, which has found quite an extended use in iron, steel, zinc and other metallurgical works in Germany.

The plan of the apparatus is shown in Figs. 1 and 2. A small amount of gas from the producers is tapped from the gas main at *d* and burned in the combustion chamber *a*. The hot gases are drawn through the evaporating chamber *b*, located near by, in which they vaporize and convert into steam as much water as is necessary for the operation and production of a good gas. The ventilator *c* (of 3 to 4 hp. for a 10-ton producer) forces into the gas producer the mixture of the products of combustion with the steam and the air, whose temperature is about 150 to 170 deg. C., and whose carbon dioxide content is about 1 to 1.50 per cent. It is evident that a mixture heated as highly as possible prevents any condensation in the steam, so that actually only the least amount of steam necessary for the operation of the producer need be formed. A temperature of over 100 deg. C. prevents the formation of sulphurous acid and consequently the corrosion of the pipes. In using saturated steam it is figured that 1 kg. of gasified coal requires from 0.4 to 0.5 kg. of steam, while a temperature of the mixture of 150 to 170 deg. C. reduces the necessary steam to 0.25 to 0.30 kg. without the formation of large lumps of slag. But the presence of small, brittle lumps of slag insures a quiet, even operation of the producers which makes itself manifest in a reduced coal consumption, even though a part of the saving in coal is neutralized in drawing off some of the producer gas for the evaporator. An important factor in the operation of gas producers with this evaporator is an isolation of the pipes. It would be well also to isolate the combustion and evaporation chambers by surrounding each with a thin brick wall and thus protect them from loss of heat on all sides.

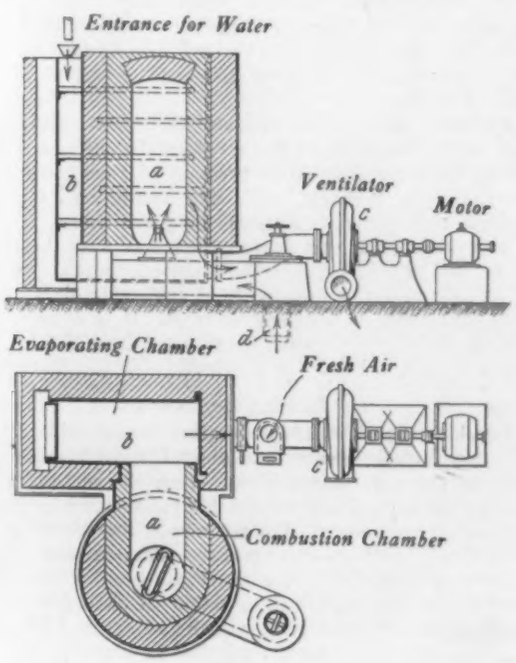


Fig. 1—Vertical Section of Apparatus
Fig. 2—Horizontal Section of Apparatus

In the table are shown some figures collected during a five months' operation of a 10-ton gas producer with a vaporizer. They show that a gas producer plant can be very profitably operated with its own vaporizing or steam producing apparatus. The advantages consist in the following: Independence from a boiler plant—a saving in wages as well as coal for the boilers; a regular and uniform operation of the producers with greater certainty of uninterruption, and continuously good gas.

Naturally, total values depend on location and on industrial conditions; but there is no doubt that the combination of a gas producer with a vaporizing apparatus is a step in advance in the technique of gas producing which will appear the more essential the more the relations between gas producer and vaporizing apparatus are studied.

Annealing Steel in a Tunnel Oven

An interesting experiment in annealing has been performed, according to the London Times, by the Dressler Tunnel Ovens Company, Ltd., London, England. The apparatus so far has been used mainly for pottery purposes but it was used recently in a trial attempt at annealing steel in a tunnel oven installed at the works of J. H. Barratt & Co., Stoke-on-Trent.

Two kinds of castings were placed on a truck which was moved slowly toward the combustion area, their temperature uniformly rising to 1000 deg. C. and then falling gradually as they passed away from the hottest zone. The journey through the oven occupied 27 hr. and at the end of it the castings were notched and broken so that the effects of the treatment on the structure of the metal might be judged. One of the steels employed contained carbon 0.10 per cent., silicon 0.17, manganese 0.19, sulphur 0.020, and phosphorus 0.052, and while before treatment its resistance to shock stresses, as determined by a notched one-blow impact test, was 11 ft.-lb. and 5 ft.-lb.; after treatment it was 46 ft.-lb. and 50 ft.-lb., while its coarse crystalline structure was found to be satisfactorily refined. The second steel was an alloy steel characterized by very large crystalline structure when cast, and it also was completely refined. There is reason to believe the time could be shortened to 10 or 12 hr. It is suggested that the tunnel might also find application in the annealing of bar steel, drawn tubes, cold rolled strips, wire coils, and other products in connection with which it is of prime importance that the atmosphere should produce no scale or even tarnish the bright surface of the goods.

A metallurgical and mining section of the Engineers' Society of Western Pennsylvania has been organized, the membership consisting chiefly of the metallurgists of the steel mills and allied industries in the Pittsburgh district and of mining engineers of the surrounding coal mining districts.

Table Showing Results of Five Months' Operation of New Apparatus

Conditions of operating	Composition of generator gases: CO_2 per cent	CO per cent	CH_4 per cent	H per cent	Approximate heat value in heat units	CO_2 content of the gases from the vaporizer in per cent	Amount of water vaporized, cbm	Temperature in deg. C: Of the product of combustion + the steam	Of the fresh air admitted	Of the mixture before its entrance into the producers	Production in 24 hours, tons
1. Without the vaporizer, but with a Körting blower	4.9	25.2	2.5	11.4	1335.5	..	3.80	..	..	..	9.5
2. With the vaporizer and with the admission of cold fresh air	4.2	27.0	2.3	12.1	1391.5	1.3	2.70	290	15	165	9.0
3. With the vaporizer and preheated fresh air	4.0	27.2	2.4	14.1	1467.0	1.3	2.61	290	100	250	8.7
4. With the vaporizer and preheated air, but diminished quantity of water	3.8	28.1	2.6	12.3	1459.0	1.4	2.10	300	110	270	8.4

Blast Furnace Progress in Scotland

The Extent to Which Modern Methods Have Been Adopted in the Past Two Decades

The West of Scotland Iron and Steel Institute some time ago held a meeting commemorative of the twenty-first anniversary of its establishment. Various papers were presented which gave a résumé of the developments in that period in iron and steel manufacture. The extent to which modern methods have been adopted by the pig-iron industry in Scotland is reflected in the following extracts from a paper submitted by T. B. Rogerson and Walter Buchanan:

The industry of pig iron making is so much older in our own country than the industry of steel making that naturally the blast furnaces were planted without regard to any development in that direction, and have for the most part remained separate from the younger branch of the industry, although not without considerable detriment to the economical production of steel. We have only two plants in Scotland where pig iron and steel making are fully combined.

Twenty-one years ago the class of ores available for making hematite pig iron was very different from what it is today. Abundant supplies of pure ores in good mechanical condition were available in the North of Spain, which made the work of the smelter a comparatively easy one. Our ores are now drawn from all the available quarters of Europe and Africa—the Mediterranean ports, Algeria, Seville, Greece, Tunis, etc., and we are already looking much farther afield for our supplies of raw materials. But in addition to the greater variety of ores with widely different chemical content, there has been a gradual deterioration in the mechanical fitness of these for ordinary use in the blast furnace. Ores have become "fine by degrees and beautifully small," having acquired a friable character unknown to the Campanils and Rubios of earlier days. And this has given rise to some developments in the blast furnace plant.

Briquetting of Ores

Briquetting we know is now in general use at iron works in one form or another. None of the plants in operation relies upon compression only. It has been found necessary in every case to burn in kilns, gas-fired or otherwise, the compressed blocks before they can be used in the blast furnace. Quite recently in this district a screening plant has been installed at the ship side for the separation of the fines from imported ores, and it is likely that this practice will develop rapidly in the near future, making the question of briquetting increasingly important.

A new development in this connecton is the sintering or nodulizing plant, and although this form of treatment of fine ores is as yet chiefly American, there is at least one works in this country and in our own district (and we know of no other) where a plant for nodulizing is in daily operation. The fines of ores by this process are fed into the plant and turned out in the form of nodules from the size of peas to the size of turnips, for charging into the furnace.

Another problem which has become important, especially in Scotland, arises out of the fuel question. The partial exhaustion of the splint coal seam in the coal fields of the West has resulted in a mixture of soft and hard coals, which is made to pass muster as splint coal; but of course this cannot bear the "burden" of the old-time Scotch splint, and we have been forced to use a certain proportion of coke in the erstwhile coal-fed furnaces of this district. Not only, therefore, is there a higher fuel consumption per ton of pig iron compared with 20 years ago (which we think will be universally admitted) but the problem of dealing with dust has come over into Scotland. The finer ores and the poorer fuel have literally "kicked up a dust" in the practice of making pig iron, and we are all at the present time in search of the best method of tackling this trouble which practically did not exist with us until recent times.

Dust-catchers there are galore, but all of them as yet are very imperfect, and we are still looking to our blast furnace experts to perfect some plan that will prevent the dust getting over into the tubes. We know that there is one furnace working with a special dust-catcher arrangement which is giving fairly satisfactory results.

By-Product Plant

It is nearly 30 years since Messrs. Alexander and McCosh took out patents for, and put in operation, a plant at the Gartsherrie iron works, and it is rather interesting to note that by-product plants have up till now mainly followed the lines upon which that early plant was laid down. These plants now form an indispensable part of the coal-fed blast furnace plant of Scotland. Indeed, every works (with one single exception, for which reasons could be given) is equipped with such a plant; and it may be said without any exaggeration whatever, that the means of the extraction of by-products came at the time to give a new lease of life to pig-iron manufacture in this part of the world. It had come about that pig iron could not profitably be made in competition with other growing districts in the North of England and elsewhere, and, barring some such relief, there was nothing for it but that the industry should in time be wiped out. The happy discovery and development of the by-products plant saved the situation. Initial outlay was heavy, but the products gave the Scotch ironmaster something like 5s. or 6s. per ton of pig iron in his favor, and served to restore the balance between him and his rival in other parts of the country.

Another development which has taken place, however, within the period of our review, in our own country and on the Continent, is the erection of coke ovens alongside the blast furnaces, with the extraction of the by-products and the utilization of the gases there.

This step goes one better than has ever been done before, and should produce the most economical results of all, though, as yet, we are without any public data of what actual advantage is obtained from it. It is enough, however, to make the Scottish ironmaster long for a coking coal, and look around for a suitable site for the ovens.

Blowing Engines

The blowing plant has undergone considerable development both in our country and abroad, though some works cling to the old reciprocating, beam or vertical engine, and find them good old serviceable tools either as primary plant or as a stand-by. On the whole, the tendency, even in Scotland, has been during these years toward a higher pressure of blast, but in this there has been greater strides elsewhere. The American practice of isolation, making each furnace self-contained, with its stoves and blast pressure, has not been generally adopted in England, but there have been instances of comparatively recent equipment in Middlesbrough and elsewhere. The turbo-blower, recently introduced, has evidently come to stay as a reliable tool for the supply of blast to the furnaces. Our own district has the credit of being the pioneer in the use of the turbo-blower, which has now been installed at quite a number of ironworks, apparently with satisfactory results. Then the gas engine, as applied at blast furnaces, has developed from the status of a toy, 18 years ago, until its present position, when units of 1000 hp. are regularly in use.

The gas engine has had a long up-hill climb, especially in its application to the absolutely constant duty of a blowing engine, for which it did not appear to be sufficiently steady and unremitting in its duty. It will be remembered that the late James Riley, at Wishaw Iron Works, experimented with a small engine driven by blast furnace gas, and the Société John Cockerill in 1895 had an 8-hp. gas engine actually running with it, but then, and for long after, the hope was only that it might in time supply power for the generation of electricity. For that purpose it undoubtedly passed into the region of complete accomplishment, but as a blowing engine, as we have indicated, it has "a hard row to hoe." However, in our district we have an installation in at least two of our works of gas engines for blowing plant, and in spite of difficulties and prolonged troubles they seem to persist and, we must presume, to give satisfaction.

The Cockerill Company alone claim to have supplied over 200,000 hp. chiefly for use in the blast furnace plants in the world; and undoubtedly the introduction of the gas engine driven by blast furnace gas as a source of power supply must be reckoned as one of the greatest developments of the last 20 years.

The Gayley Dry Blast

It was upon the visit of the Iron and Steel Institute to America in October, 1904, just nine years ago, that

James Gayley read a paper on the experience obtained at the Isabella furnace of the Carnegie Steel Company, by the use of the dry-air blast, and this he supplemented by a paper with further data at the following meeting in London in May, 1905. The discussions at these meetings may be referred to by the curious to show the high hopes that were then entertained of the future use of dry blast in the making of pig iron, but so far these have not been very generally realized.

It was expected by the enthusiasts that the dry blast of Gayley would revolutionize the making of iron, very much as did the hot blast of Neilson. It remains a rather significant fact that the installation of plants, even in the States, that land of experiments and inventions, has been very slow, and in Britain very few plants have been erected.

There is no question at all that the presence of moisture in the blast is detrimental to economy, and that desiccated air, if readily obtained, would prove greatly beneficial to the working of the blast furnace. But whether the cost of drying the air by special process is not more than the resulting economy will warrant, in spite of the claims made by the promoters and users of the plant, both in this country and America, remains as yet an unsettled problem among ironmasters. It is a gallant attempt to meet a long-known evil, but a too costly one in its present form.

Filling and Handling Systems

In Scotland the system of hand filling, with one or two exceptions, continues to prevail. This, however, need not be put down to want of appreciation of the mechanical appliances ready to hand, still less need it be inferred that the Scotsman's well-known genius for economy has deserted him on this occasion; but the conditions are different, and the slower driving arising from the use of raw coal as fuel, and the consequent lower pressure of blast and smaller output, do not make the same call upon us to adopt mechanical charging. It is not a question of necessity with us, as yet at least, but one of economy only. The apparatus is there for the using, and one may safely leave it to the judgment of the blast-furnace managers as to when it is wise to adopt it.

We are happier at the iron works than they are at the steel works, in respect that all the electricity we require is provided by the furnaces practically free of cost. A share of the surplus gas (after it has been robbed of its by-products and done all the work of raising steam for the blowing plant, and of heating the stoves and other accessories) is equal to generating the electricity wanted for lighting the works and houses, for pumping water for cooling and condensing, for hoisting materials to the furnace tops, for driving the workshops' plant, for operating cranes and other appliances about the works, in fact for doing far more than we have to do when the iron works is separated from its proper partner—the steel works. This is undoubtedly our most important achievement during those years of progress with which we are dealing.

Another very laborious job in the iron works was the lifting and breaking of pig iron, and this has been tackled in recent years in many works in a most satisfactory fashion, and the heavy labor entirely gotten rid of.

The Disposal of Slag

The disposal and utilization of the slag have become increasingly important, because with more silicious materials to deal with in the furnaces we have a larger flow of slag, while at the same time we have a gradually restricted place to put it. The method of handling the slag as it comes from the furnace has undergone some change, and to-day it is not uncommon to see it run molten into ladles and poured over the tip end, although the earlier method of running it into blocks and tipping the solid lumps over a more or less distant heap still obtains. But what we still want is a profitable outlet for what has all along been a waste product, and a wasteful one as well.

Difficulties of no ordinary kind have been encountered in producing from the varying "scoots" of slag coming from different furnaces, and even from the same furnace, a sufficiently regular product to be converted into a homogeneous cement. But these difficulties have in large measure been overcome and most of us are already users of the material to a greater or less extent. Of course the making of slag bricks and flags has been going on in Germany, France, and Belgium for a considerable time.

Another hopeful outlet for the waste product of blast-furnace slag is one to which the ubiquitous motor car may be said to have given birth. The road authorities have been compelled to search for something to lessen or do away with the dust created by fast-running traffic on our macadamized roadways. Tar spraying is only partly successful, and asphalted val-de-travers is too soft for our heavy traffic, besides being too dear for country roads where it is most required. A material has been produced from slag, which bids fair at once to meet the difficulty of the road surveyor, and to turn the slag into a profitable by-product of the blast furnace. This consists of the impregnation of slag while it is still hot, with tar products, so as to give a through-and-through absorption in the body of the material, and is said to yield a product for road making which is impervious to water and will grind to the core without giving off dust. It is already being turned out in the Midlands of England in large quantities, and used with the greatest success on specified miles of country roads all over the Southern counties. The material has been christened "Tar-Mac," and it will probably be in general production all over Britain before long.

Anglo-American Exposition in 1914

The Anglo-American Exposition, whose American executive offices are in the Woolworth Building, New York City, is actively distributing literature calling attention to the project. The exposition is to be held in London from May to October, 1914, under distinguished patronage, to celebrate in part 100 years of peace between the United States and Great Britain. It is not the signing of the treaty of Ghent alone, however, that both nations will unite in celebrating "but also the development and spread among the masses of the people of both countries of that spirit of mutual understanding and good will which makes the idea of armed conflict between them as abhorrent as its existence is unthinkable." Large space will be given to the products of inventive genius and industry. It is believed that the evidences thus afforded of manufacturing enterprise will help to strengthen the present bond of commercial union between the United States and the United Kingdom. Ample grounds and appropriate buildings are provided to receive the exhibits from both nations.

The American vice-presidents of the exposition are as follows: Nicholas Murray Butler, president Columbia University, New York City; Joseph H. Choate, New York City, formerly ambassador to the Court of St. James; Abbott M. Lowell, president Harvard University, Cambridge, Mass.; James B. Forgan, president First National Bank, Chicago, Ill.; David R. Francis, ex-Governor of Missouri, St. Louis, Mo.; Alba B. Johnson, president Baldwin Locomotive Works, Philadelphia, Pa., and Samuel Mather, Cleveland, Ohio.

The American executive committee is composed of the following: J. J. Arnold, Chicago Association of Commerce, Chicago, Ill.; James A. Chadwick, Fall River, Mass.; J. B. Dimmick, Scranton, Pa.; Walter A. Draper, president Chamber of Commerce, Cincinnati, Ohio; H. A. Fitch, Kansas City, Mo.; W. O. Hart, New Orleans, La.; George H. Kelly, president Commercial Club, Omaha, Neb.; Clarence R. Mengel, Louisville, Ky.; Frank L. Mulholland, president Commerce Club, Toledo, Ohio; Erskine Ramsay, Birmingham, Ala.; W. Champlin Robinson, Baltimore, Md.; Ashton Starke, Richmond, Va.; William H. Stevenson, president Chamber of Commerce, Pittsburgh, Pa.; G. F. Watt, Harrisburg, Pa., and Harry Welch, secretary Phoenix Board of Trade, Phoenix, Ariz.

Plans are under way for the reorganization of the Dean Electric Company, Elyria, Ohio. A committee has been appointed to co-operate with the management in the reorganization. E. F. Allen, Elyria, will represent the bondholders; J. M. Lenz, Chicago, the merchandise creditors, and A. R. Garford, Elyria, the banking creditors. Attorneys M. B. and H. H. Johnson, of Cleveland, have the reorganization in charge. The company manufactures telephone apparatus and other electrical supplies. There will be no interruption in the operation of the plant.

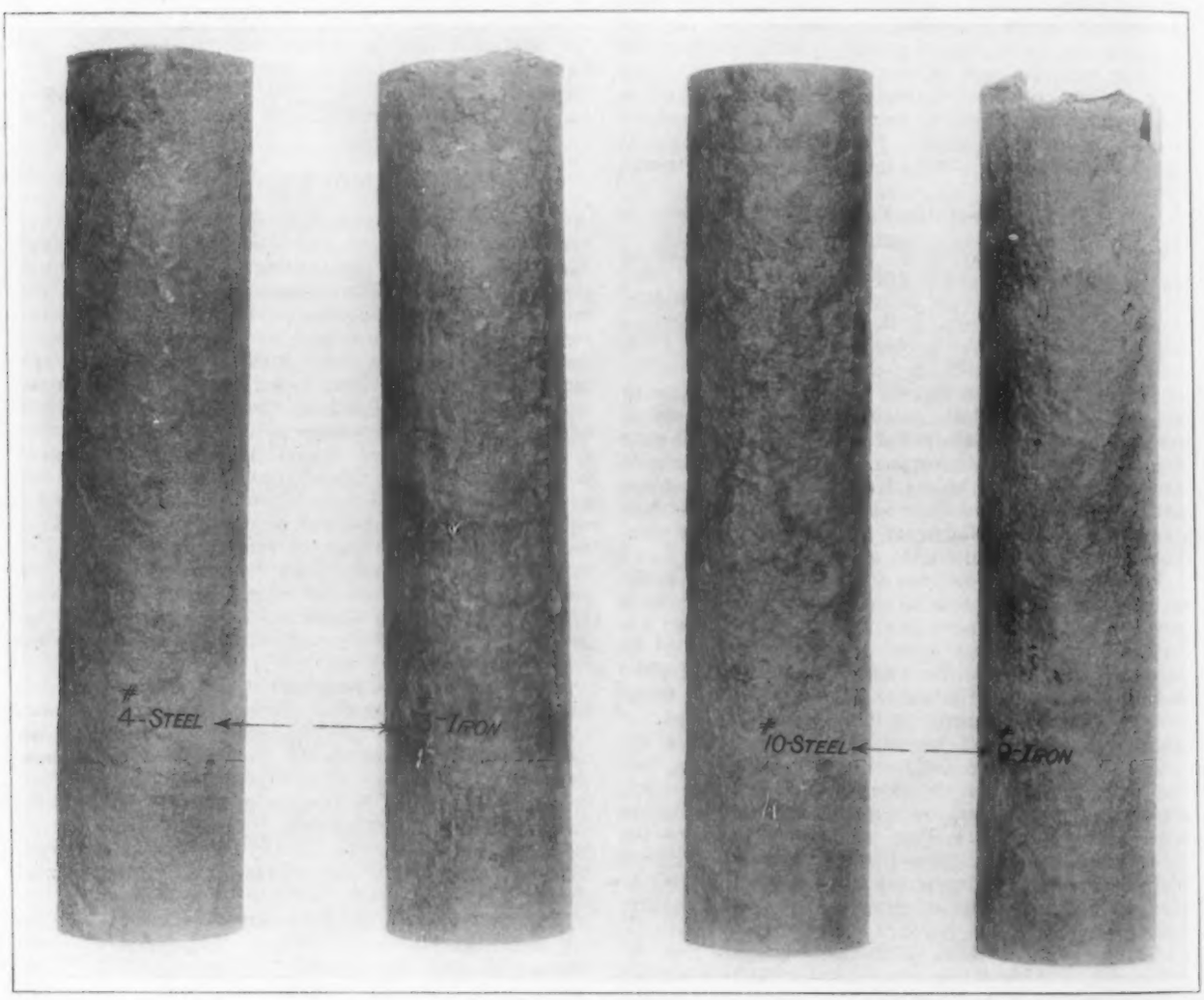
Corrosion of Pipe in Refrigerating Systems*

Comparison of Steel and Wrought Iron Pipe Used in an Ammonia Condenser

BY F. N. SPELLER†

The day has passed when engineers and architects or large consumers themselves feel content in specifying some class of pipe, such as wrought iron or steel, for it is becoming more generally recognized, as the result of many comparative tests in service, that there is more difference in durability, considering corrosion per se, between various grades of wrought-iron or steel pipe than between wrought iron or steel as a class.

As a recent example of direct comparisons, where both materials were put into service at the same time and have been subjected together to the same conditions for a sufficient length of time to cause serious corrosion, we might refer to a condenser recently taken apart at the Union Stock Yards, Chicago. The illustration shows details of the corrosion and pitting of the most corroded parts of these pipes. Not much difference in the resistance to corrosion of the two materials is evident although this steel pipe, installed 13 years ago, is higher in impurities and not so well worked as some modern steel pipe. A large number of such cases from widely separated localities are on record mostly from hot water service lines, all showing the same results.



Corrosion Comparison of Two-Inch Pipe After Eighteen Years' Service from Atmospheric Ammonia Condenser at One of the Largest Refrigerating Plants in the World, Union Stock Yards, Chicago

Objections to Recent Explanations

In attempting to explain the results of one of these investigations conducted at the New York City public baths by Professor Ira Woolson, an official of a leading wrought-iron interest, says in *The Iron Age*, November 20, 1913, that this was evidently "wrought-iron pipe made of junk-yard scrap" furnished by unscrupulous parties. He does not explain how one is to distinguish between good iron and poor iron in buying pipe nor does he explain how it happens that in nearly every large installation of piping put in about 10 years ago, when iron and steel pipe were used in more nearly equal proportions than today, the same mixture will usually be found. As a matter of fact, a detailed examination of some of this corroded wrought iron showed it to be quite normal in quality. It takes time and experience to make such tests and it is evidently impossible to go over each length of pipe. It is manifestly begging the question to suggest that all the iron which fails is necessarily of poor grade.

It is significant to note that the company responsible for the lengthy epistle above referred to, and who claim to use no steel in the manufacture of pipe, have been making steel boiler tubes for at least 20 years, from skelp bought outside their mills. It would be interesting to know the real reason for their not using steel for pipe, which is 50 per cent. thicker for the same diameter, and usually not subject to such strenuous service as is found in most boiler plants.

Steel Pipe Improved in the Past Ten Years

Apparently pipe so mixed, whatever the quality may be, represents the general run of pipe on the market at the time it was used. Furthermore, steel pipe has certainly been improved in the past 10 years as better facilities for controlling the quality have been found. On the other hand, there is good reason to fear that the quality of wrought iron has deteriorated in the same period. There are many influences working in that direction—in fact, the publications of leading manufacturers of wrought-iron pipe

*From an address illustrated with motion pictures covering the manufacture of pipe made before the American Society of Refrigerating Engineers, New York, December 1.

†Metallurgical engineer, National Tube Company, Pittsburgh.

practically admit that there is on the market today a much larger proportion of inferior iron made from miscellaneous scrap, and this is only one factor which tends toward irregular quality.

In all the mass of publications and letters on the subject of corrosion by the wrought-iron interests, the letter above referred to contains the first reference to these service investigations of pipe which have been going on for the past four years. Practically all the arguments by wrought-iron manufacturers consist of expressions of opinion of uncertain basis, reference to isolated cases of roofing failures or other irrelevant experience having nothing to do with the pipe question. Too often the conclusions of unbiased experts are entirely misrepresented by quoting a few lines from reports and ignoring the context and final conclusions. Such opinions and appeals to prejudice can be accounted for but the plain facts cannot be explained away. It is no longer necessary to depend on laboratory tests as steel pipe has now been in use 25 years; in any case, it is well known that we have always deprecated the acid test, and have advocated direct comparisons under conditions of natural corrosion, preferably in actual service.

If the data from nearly 200 service comparisons, showing the general equality of wrought-iron and steel pipe made about 10 years ago, are as convincing to you, as they are to us, it would seem to follow that the best pipe will be made in those mills which are self-contained and able to specialize upon the produce pipe steel exclusively and which have the oldest and best trained organization. All these are vital factors in maintaining a uniformly high standard of pipe.

Bibliography

For reference, the following list of papers is appended, which contains comparative facts on corrosion:

"The Relative Corrosion of Iron and Steel Pipe as Found in Service"—Wm. H. Walker, Journal of New England Water Works Association, March, 1912.

"Corrosion of Hot-Water Piping in Bathhouses."—Ira H. Woolson, Engineering News, December 3, 1910.

"The Corrosion of Iron and Steel"—J. Newton Friend. (Longmans-Green Company, 1911).

"The Corrosion of Iron and Steel"—A. Sang. (McGraw-Hill Book Company, 1911).

"Report of Committee on Relative Corrosion of Wrought-Iron and Steel Pipes"—American Society of Heating and Ventilating Engineers, Proceedings 1909.

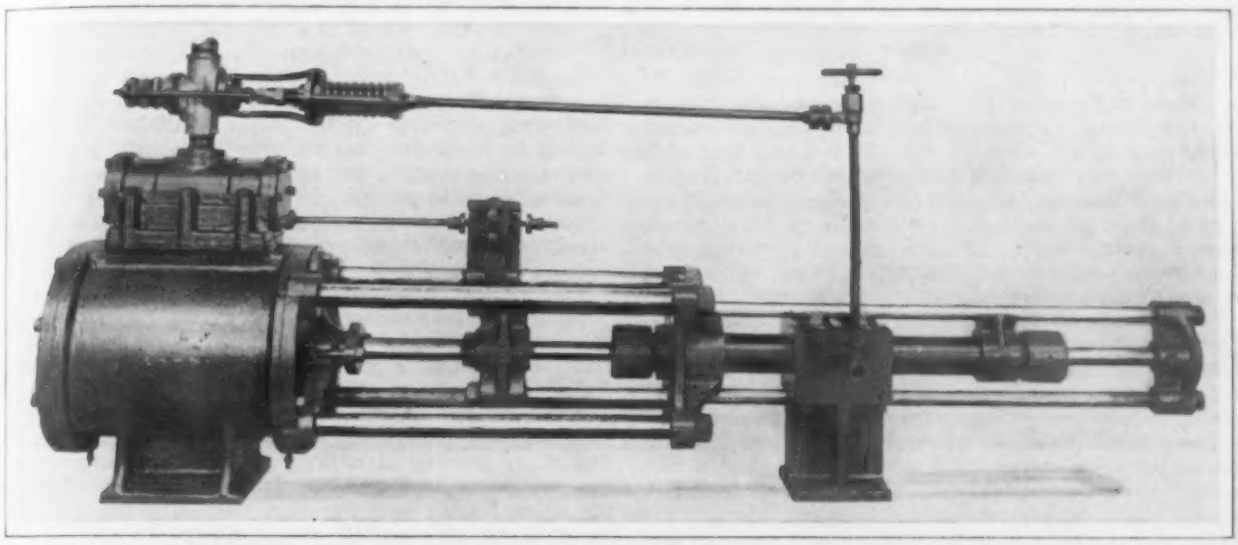
"Corrosion of Boiler Tubes"—Rear Admiral John D. Ford, U.S.N. Journal of American Society of Naval Engineers, May, 1904.

"Comparative Service Obtained with Wrought-Iron and Soft Steel Pipes as Water Lines in the United States"—F. N. Speller. Proceedings International Association for Testing Materials, 1912. Vol. II.

"Corrosion and Preservation of Iron and Steel"—Cushman and Gardner. (McGraw-Hill Book Co., 1910).

Hydraulic Steam Pump with Special Governor

The Hydraulic Press Mfg. Company, Mt. Gilead, Ohio, has designed a new line of hydraulic steam pumps, which are equipped with a special pressure and speed governor. The pump is of the single-cylinder double-acting pattern and is built in a wide range of sizes. The special features of the new line are a long piston stroke, elimination of short stroking and arrangement to adjust the steam valve gear while the pump is in motion.

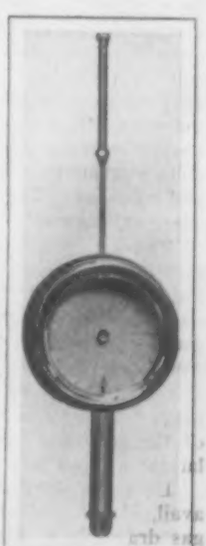


One of a New Line of Hydraulic Steam Pumps Equipped with a Special Speed and Pressure Governor

The governor shown in the upper right portion of the accompanying illustration has an adjustment which can be set for the speed and pressure desired. It cuts off the steam supply to the pump when the predetermined maximum pressure is reached and also regulates the speed when a desired number of strokes is important. In this way, it is pointed out, possible breakage of the pump, but especially of a press and fittings to which it is connected, from excessive pressure, is prevented, and of course the pump is prevented from racing if the pressure should be released suddenly.

A Hydrostatic Vacuum Recording Gauge

The Uehling Instrument Company, Passaic, N. J., has developed a new type of vacuum recording gauge. The pen is actuated by a float resting on mercury contained in a cylindrical float chamber attached to the lower side of the clock case. A steel tube of the proper length to contain a column of mercury to balance the atmospheric pressure is connected with this chamber, the cross-sectional areas of the float chamber and the pressure tube being such that the pen moves over the full width of the chart for the range of vacuum to be recorded. The gauges are made in ranges for vacuums between zero and 30 in., from 20 to 30 in. and 25 to 30 in., the second one being the size illustrated. The advantage claimed for this number of ranges is that an open scale is secured in each instance where the question of securing accurate readings easily is of the greatest importance.



An Improved Design of Vacuum Recording Gauge Operating on the Hydrostatic Principle

On December 2 the Pennsylvania Railroad suspended several hundred employees at its Altoona shops and reduced the time from 55 or 60 to 40 hours per week in most of the shops.

Status of the Large Gas Engine in Europe*

One-Piece and Two-Piece Cylinders—Scavenging Under Pressure—Utilization of Waste Gases—Cooling Water Above 212 Deg.

BY PROF. PAUL LANGER†

About 11 years ago the large gas engine was brought to a high state of perfection by the Maschinenfabrik Nuernberg in the form of the double-acting four-cycle type, with two cylinders arranged in tandem. It was recognized that the principles on which to base the design of large gas engines should involve (*a*) the greatest possible accessibility of all parts exposed to the gases of combustion, and (*b*) relieving the cylinder wall of the weight of the piston.

In the case of the steam engine a leaky piston does no further damage than to increase the steam consumption. The governor automatically adjusts for a longer cut-off and the engine pulls through as long as the boiler furnishes sufficient steam. With the gas engine, a leaky piston causes ignition at the wrong time which means a release of heat energy at a time and place when this energy can do no useful work. The attention needed to prevent such disturbances cannot be given when access to such vital parts as pistons, stuffing box packings and valves can be had only after a long and difficult job of disassembling. The author knows of an engine which, after six years of continuous day and night operation, showed only 0.015 in. wear in the diameter of the cylinder. This success, although immediately traceable to the careful attention this machine received, is nevertheless indirectly due to the designer who made it possible to give such attention through the excellence of his design.

Regulation of Large Gas Engines

The attempt to attain stratification of the mixture inside of the cylinder has led to very complicated valve gears. It was hoped that a gas valve, which remained open during only a part of the surface stroke, would direct the gas in such a manner that a combustible mixture would be present at the point of ignition even under the lightest loads, while the balance of the combustion space would be filled with inert air. The result, however, did not justify this hope. Instead of stratification there was only a bad mixture resulting in irregular and uneven operation. Today the hope of attaining stratification can be considered as being finally disposed of and designers have returned to the simple throttling valve gear.

Throttling of gas and air simultaneously, or in other words, regulation of the quantity of mixture only, is to be preferred to the throttling of gas only, as the former method is less sensitive and makes possible a more certain control of the power developed by the governor. The result of throttling is to reduce the quantity of mixture drawn into the cylinder during each stroke, on account of the reduced openings for gas and air. The volume of the charge remains the same, as the cylinder is always completely filled. The density of the charge will become less and correspondingly its weight and the amount of energy supplied.

The connection between the governor sleeve and the throttling mechanism should be changed so that in the low positions of the governor the throttling action is more intensive than in the upper positions. This action can be accomplished in a simple manner by offsetting the connecting link between the governor and the throttling valve, similar to the arrangement found in Corliss valve gears. This allows a uniform utilization of the total lift of the governor, and consequently stable and quiet regulation, without any complication whatever.

Even the best considered scheme of regulation will not avail, if the proportion of mixture, that is the ratio of gas drawn in to air drawn in, is not properly controlled. In engines that have separate pumps for air and gas, as usual in two-cycle machines, where, therefore, air and gas are furnished in measured quantities, it is a comparatively easy matter to get the proper proportion, at least at full load. Difficulties are found, however, in four-cycle machines, where gas and air are drawn in by the working piston in parallel. In this case the proportion of mixture is not readily controlled, because the quantities drawn in depend not only on the free opening of the admission valve, but on the product of this opening area and the velocity of flow through it. Incidental changes in pressure, due to static or dynamic causes, may influence this velocity strongly. The difference in specific gravity must be considered when deciding upon the proportions of the ports for correct mixture in engines that use gases lighter than air. A disregard of this fact leads to too rich mixtures and the engine becomes choked with gas. The many failures of engines working with coke oven gas are partly explained by wrongly proportioned gas ports. At least, proper operation resulted in many cases from materially reduced gas ports. To avoid too intensive a throttling action and consequent reduction of power, the piping and other passages leading to the mixing valve must be proportioned liberally, so that the total drop in pressure is advantageously concentrated within the valve itself.

For a long time great difficulties were presented by the problem of driving variable speed blowing engines by four-cycle gas engines. In most cases the gas arrives at the mixing valve under a pressure of several inches of water above the atmosphere, while the pressure of the air is somewhat less than atmospheric. When the machine is run slower the suction action of the piston is reduced and the intake velocity of the air decreases more rapidly than that of the gas, until finally it is reduced to such an extent that nothing but gas enters the cylinder. It is self-evident that, even before this point is reached, the engine will choke with gas and will stop. A governor which regulates the quality of the mixture would only favor this suffocation of the engine with gas. In such cases, too, the conditions are improved by intensive throttling at normal speed.

Avoiding Cracks in Cylinders

Improvements of design as well as improvements in foundry practice have reduced the breakage of cylinders to a point where it is now rather a rare occurrence. Views upon the most suitable shape still differ, however, considerably. While in all others details of large gas engines standard designs have been developed, which serve all purposes, the cylinder designs still vary considerably. The fact that some designers, after careful experiments, have abandoned the split jacket cylinder in favor of the normal one-piece cylinder, while others, also after careful experiments, have gone in exactly the opposite direction, and split not only the jacket, but also the inside cylinder, seems to show an uncertainty in judging the causes of breakage. These differences in design, however, are caused largely by fixed ideas of the purchasers whose special wishes are complied with by clever salesmen. The one-piece cylinder is just as strong as the split one. The split cylinder has come principally from the desire to avoid initial stresses in the direction of its axis, which put the inner cylinder under tension on account of the fact that in casting it cools later than the rest of the casting. Besides, by casting the two halves separately, it was attempted to obtain as dense as possible a wall for the combustion chamber. Finally, splitting the cylinder has the advantage that customers who consider a cylinder liner the proper construction can be satisfied, inasmuch as the insertion of liners in one-piece cylinders presents some difficulties, though these are not to be considered insurmountable.

Besides the advantage of simplicity and the absence of

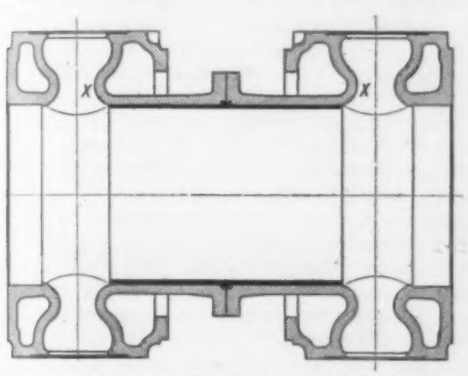
*From a paper read before the American Society of Mechanical Engineers, New York, December 4.

†Technische Hochschule, Aachen, Germany.

the danger of leakage in the highly strained cylinder joint, the one-piece cylinder allows a better transmission of the forces from the cylinder to the frame. As a matter of fact, breakage on account of strains in the casting or from expansion due to heat, has not occurred in cylinders that were properly reinforced. Improvements in foundry practice have undoubtedly helped to avoid such breakage.

While breaks have an origin in the strains set up by irregular cooling of the casting or by irregular heating in operation, cracks of an entirely different nature have been observed on the walls of the combustion chamber. These so-called fire cracks always start in a place where the transmission of heat to the cooling water was impeded from some cause or other. The cause of these cracks is to be found in the stresses produced by unequal temperatures within the same wall. In the smooth and homogeneous wall the differences in temperature of the different strata are small and the temperature of the wall is comparatively low, as long as accumulated scale or similar causes do not offer an obstacle to the transmission of heat. When, however, the capacity of the wall for conducting heat, or the rate of transmitting heat to the cooling water is reduced, there will be accumulation of heat which will cause a considerable rise of temperature during the expansion and exhaust strokes. The material will tend to expand according to the average temperature of the wall moment over the different zones of the wall. If we bear in mind, however, that a difference in temperature of 200 deg. F., when the expansion is restrained, corresponds to a strain of about 15,000 lb. per sq. in., we are surprised to find that cracks do not occur more often. The occurrence of a crack, which in the beginning is scarcely ⅛ in. deep, apparently relieves the strain to a certain extent and only the natural tendency of the cast material to continue to break together with the external mechanical forces causes the crack to open further. In most cases drilling and calking at the end of the crack will stop this. The timely discovery of the crack is, however, rather difficult, as it is not open after the wall is uniformly cooled.

The first step in combating the occurrence of these cracks must reduce their real source, i. e., the differences in temperature, to an amount that is harmless. As the sudden changes of temperature are caused by the very nature of the gas engine cycle, these attempts must be confined to avoiding all irregular ignition and slow combustion, both of which are likely to increase the temperature of the cycle beyond the normal as well as the difference in temperature when the sudden change occurs at the beginning of the suction stroke. Furthermore, it is necessary to make the conductivity of the wall uniform in order to avoid all accumulations of heat in the material.



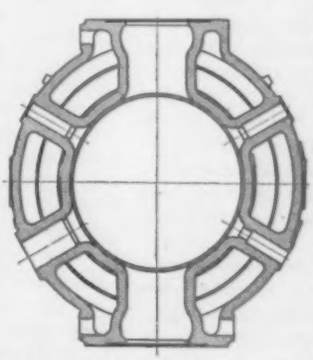


Fig. 1—Split Jacket Gas Engine Cylinder with Split Inside Cylinder. Points as at X Are Subject to Heat Accumulations and Therefore to Cracks

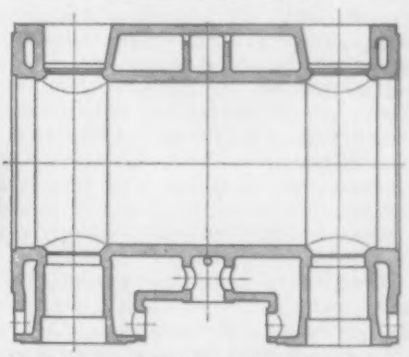


Fig. 2—Recent Design of One-Piece Gas Engine Cylinder Without Globe Shaped Passages to Valves

and it will be able to do this without resistance because it was under tension on account of the strain in the casting. In operation, therefore, the strain will be relieved. On account of temperature differences, however, in different strata of the wall, there will be stresses in the wall itself, compression in the hotter zones and tension in the cooler ones.

This condition of stress can be compared with that existing in a bar being bent towards the inside of the cylinder. In the hotter layer the expansion being resisted causes compression stresses, and in the colder layers there will be tension stresses. As soon as cold mixture is admitted during the next suction stroke, the surface of the wall is cooled intensively. The inside layers of the wall cannot follow rapidly enough to cause the establishment of settled conditions corresponding to this flow of heat. The mean temperature of the wall, and consequently its average expansion can only be affected very slightly during the first moment of internal cooling by the entering cold mixture. The innermost layer will be under strong tension on account of the sudden cooling. This jumping of the temperature acts upon the material in much the same manner as sudden flexure from the inside to the outside would. The inside layer of the wall of the combustion chamber, therefore, is exposed to the same kind of stresses as the outside fiber of a bar that is continuously bent in both directions by blows. The stresses which occur under these conditions are about proportional to the difference in temperature, the coefficient of heat expansion, and the modulus of elasticity, if, indeed, one can speak of such in the case of cast iron.

This is an extraordinarily unfavorable case of strain. Cases of strain on account of sudden changes of temperature are not rare, but these conditions are worst in the cylinders of gas engines, on account of the rapid succession of the changes in temperature. A mathematical deduction of these stresses is out of the question on account of the impossibility of obtaining even halfway accurate data on the distribution of temperature at any one

It is therefore necessary to avoid all accumulations of material.

The commonly used globe or onion-shaped passages for inlet and exhaust valves are therefore not suitable, and lately the form shown in Fig. 2 is very properly preferred. Here the valves are brought close to the inner surface of the cylinder.

In a much more effective manner than by measures of design, can the heat cracks, and in fact all cracks that occur in gas engine cylinders, be avoided by proper choice of a material, the constant of which (coefficient of heat expansion multiplied by modulus of elasticity) is less with the same tensile strength than in the case of the cast iron. The less the expansion from heat, which is the real cause of the strain, and the more elastic the material, the less the strain. Considering the enormous progress which metallurgical science has recorded in the past few years, a solution of this question of material should appear possible, and the more so, as nickel steel alloys have actually been made for accurate rules, in which expansion from heat cannot be detected at all.

An investigation of the constants in question (coefficient of heat expansion multiplied by modulus of elasticity) upon which depends, according to the foregoing, the strain of the material resulting from uneven temperature, shows that steel castings are not suitable for gas engine cylinders. The larger expansion due to heat as compared with cast iron and the very much higher modulus of elasticity causes increased stresses, while the strength of steel cast is not proportionately greater. Experience confirms this conclusion.

On Increasing the Output of Large Gas Engines

The principal task upon which the gas engineer is laboring incessantly, besides that of enhancing the reliability of the machine, is that of making it cheaper, partly by simplifying its construction, partly by increasing its output. At present it can hardly be imagined that the gas engine can be made cheaper by making its construction

simpler, now that the complicated valve gears have disappeared. Reduction of weight is not to be recommended. Until recently experience has demanded a continuous increase of engine weights. Economy in material would reduce reliability and length of life of the machine. The mechanism has been developed into standard designs, so that in this detail there is nothing to be saved. Somewhat better prospects seem to be opened by the attempt to reduce the cost by increasing the output of the machine of a given size.

Increasing the number of revolutions per minute is not practicable, at least not with less combustible gases such as blast furnace gases. The reliability of the machines would be lessened, not even considering the fact that the time available for the combustion of the mixture is too short and that therefore the losses on account of incomplete combustion would become too large. A comparison of the results of operation of gas operated blowing engines, which run relatively slow, and engines driving dynamos, proves that the former require considerably less repairs than the latter. Increasing the number of revolutions would increase the idle time on account of repairs and a gain in output can hardly be expected.

A method for increasing the output which lately has attracted renewed interest consists in increasing the pressure of the charge and simultaneous scavenging of the exhaust gases. In this manner a given suction volume of an engine can accommodate a larger weight of charge and greater output of power can be attained. The original purpose of this method, which has been known in England for many years, was the avoidance of pre-ignition by scavenging the cylinder of what remained of the hot exhaust gases. It is the competition into which the gas engine has lately had to enter with the steam turbine, that has brought to the front the possibility of increased power output and consequently lower cost of the machine per unit of power.

The simplest method of realizing the scheme of scavenging and charging consists in closing the exhaust valve late and opening the inlet valve early. The time during which both valves are open is used for scavenging. In order surely to avoid loss of gas, the charging with gas is only commenced after the exhaust valve is closed. At the end of the suction stroke the mixing chamber must be cleansed of combustible mixture by scavenging, or rinsing, with pure air, as otherwise backfires would occur at the beginning of the next scavenging period. Gas and air are brought to the machine under a pressure of about 3 lb. per square inch gauge. On account of this increased pressure the weight of the charge is about 20 per cent. greater than that of the normal method. Scavenging the combustion chamber also furnishes further space for fresh mixture. Experiments have shown a mean effective pressure of about 100 lb. per square inch. In continuous operation, insofar as we can speak of such in experiments, mean effective pressures of 85 lb. per square inch can be reached.

Undoubtedly such results present much that is attractive, especially as the output can still be increased by further increasing the pressure, and as this would give to the gas engine the capacity for overloads which heretofore it did not possess in the same sense in which steam engines do. Experiments have also proved that these overloads can be had without an increase of the maximum pressure. This is done by reducing the compression.

In spite of the lower compression the heat consumption per unit of power was not increased. It seems that this result is explained first by better combustion of the charge which is not contaminated by the remains of the exhaust gases, and secondly by a decreased percentage of loss in the cooling water. The predominating influence can only be found by means of carefully measured heat balances which at present are not available. The increased temperature of the cylinder walls, which has been found thermo-electrically, has caused objections against continued operation with scavenging and forced charge. A certain justification cannot be denied to these objections. The decrease of continuous loads is the very factor that has contributed to overcome the difficulties of operation. To endanger a regular operation by increasing the power output must appear to be a dangerous experiment in just such cases where the equipment is insufficient and an increase is highly desirable. The disposition on the part of operating engineers to await developments is easy to understand. The present satisfactory operation, which is the result of years of toil, is making these engineers justly conservative.

Utilizing Waste Heat

The endless desire of gas engine builders to improve the economy of the gas engine has lately brought to the front interest in the utilization of waste heat. According to experience, a blast-furnace-gas-engine dynamo consumes in continuous service on the average about 16,000 B.t.u. per kilowatt-hour. Of this amount of heat only 3412 B.t.u. is converted into electrical energy. Of the balance, 12,588 B.t.u., the mechanical, electrical, and radiation losses have to be regarded as unredeemable, as well as the energy contained in the unburned gases. The heat in the cooling water about 4800 B.t.u., and that in the exhaust about 5200 B.t.u. per kilowatt-hour is, however, available for a more or less perfect further utilization. The high temperature of the exhaust, about 880 deg. F., measured at the exhaust flange, makes possible its immediate use for the generation of steam in boilers, which have to be placed as closely as possible to the exhaust chamber. As a matter of fact it is possible to obtain about 2 lb. of high-pressure steam per kilowatt-hour of the gas engine.

The utilization of the heat in the cooling water is not possible as directly as this. The further use of this heat for power purposes means the generation of steam and this requires a considerably higher temperature than that customary today in large gas engines. Karl Semmler suggested as long ago as ten years that gas engine cylinders be cooled with water hotter than 212 deg. F., and that this water be put under pressure in order to avoid the generation of steam in the packet. Evaporation commences only outside of the jacket, when the superheated water is conducted through a throttle valve into a steam drum. It may be easily understood that this "hot cooling" scheme has been regarded rather skeptically for a long time. About a year ago it was decided at the Rombacher Huetten Werke to try Semmler's cooling method on an 800-kw. tandem engine. The results in operation, which are available today, are entirely favorable. The hot jacket not only did not hurt the cylinder, but it caused apparently a softer and quieter operation of the machine.

The use of distilled water in a closed sycle, the considerably higher temperature of the outer cylinder wall, which causes nearly equal average temperatures of the inner and outer cylinder walls, are surely advantages which, if the favorable experiences last, merit more consideration than the recovery of waste heat. The amount produced is in the case of the engine mentioned, about 1.1 lb. of steam of low pressure per kilowatt-hour. There is no doubt that this figure can be very much improved by designing the cylinders more suitably for this purpose, by careful insulation and by connecting the cooling water from the piston, which heretofore has not been used.

The results achieved in recovery of waste heat will be of different practical value for different types of blast furnace plants. Where there is a steam plant in addition to gas plants, it would be advantageous to shut down some of the boilers and substitute steam from the waste heat boilers by connecting them to the steam mains, because this steam can be produced almost without cost for attendance and for fuel, and therefore, as cheaply as is possible.

Gas Engine vs. Steam Turbine

In conclusion it is well to touch in a few words, upon the competition between the gas engine and the steam turbine, which lately has become very keen in Germany as well as in the United States. The steam turbine has doubtless made much progress during the last few years. In its perfected form in which we know it today, it is a thoroughly reliable machine. Its overload capacity, with nearly constant steam consumption per power unit, is limited by its accessories, as boiler and condenser. In addition, there is its principal advantage of lower first cost as compared with the gas engine. Its disadvantage is the higher consumption of heat per unit of power. The gas engine produces approximately twice the amount of energy from a given amount of heat, and is therefore, vastly superior as a fuel saver from the economic point of view. To the business man, however, the question of lower first cost often appeals more strongly. The favorable balance sheet of the current year pleases him better than the quiet satisfaction of the knowledge that he has

saved valuable treasures of fuel for his great grandchildren. But even from this standpoint the gas engine can be victorious over the steam turbine in cases where the available waste gases are not so abundant that their combustion under steam boilers would suffice to satisfy the existing requirements for electrical energy. Whether and to what extent these conditions will be changed by the new method of surface combustion, is a matter which the future will show.

Discussion

The paper was read before the gas power section of the society and presentation was made by Professor Langer himself. The session was presided over by Prof. F. R. Hutton and the opening discussion was not inappropriately made by H. F. J. Freyn, consulting engineer of the Allis-Chalmers Mfg. Company, Milwaukee, Wis., himself a student by personal investigation of gas engine construction and operation in Europe. The paper was well received and Chairman Hutton, Mr. Freyn and Prof. R. H. Fernald, University of Pennsylvania, emphasized the practical importance of the paper and the good fortune of the society in securing it. Mr. Freyn spoke in part as follows:

Views of H. F. J. Freyn

He asserted that Professor Langer's contention was perfectly correct that regulation of the gas engine by stratification, that is by quality of the mixture, has been abandoned in European practice, largely on account of difficulties met with in low loads, particularly in the case of large tandem four-cycle engines. With regard to regulation by throttling both the gas and air deliveries simultaneously, he expressed belief that the better practice, or at least the regular practice, was to throttle both air and gas up to say 70 per cent. of the load, but between the point and full load to throttle the gas only. The air regulating valve, say of the butterfly type, is set by hand, and only the gas is under the influence of the governor.

He is in agreement with Professor Langer's explanation regarding the material for gas engine cylinders, and thoroughly endorsed his statements. Several years ago cylinders for blast furnace gas engines at Bruckhausen, built of steel castings by Thyssen & Co., cracked in a short time, and this, he said, has been the experience in America. He believes that cylinders of steel castings have the decided disadvantage that the lubricating qualities are not so good as cast iron, and do not stand wear so well, although this, of course, may be overcome by the use of cast-iron liners. In America the cast iron used was originally too soft, and resulted in too much wear, this leading to a successful cast-iron liner of a harder mixture. He knew of some liners which showed no wear after considerable use. It is hard, however, he said, to insert a hard cast-iron liner into a soft cast-iron cylinder.

With regard to fire cracks in cast-iron cylinders and those with the so-called onion-shaped valve chambers, he believed that these cracks are not vital, but seemed to relieve stresses, and with careful caulking do not seem to extend further. He spoke of engines in operation with cracks five years old.

He regarded the scavenging and surcharging method as of revolutionary importance and mentioned briefly two plants he had seen in Europe in operation, with the so-called surcharging method of scavenging. If one, he suggested, can increase the power of the engine 25 per cent. by this method, it means a reduction of weight per horsepower of output and therefore a unit lower cost of installation. It would mean that a 10,000-hp. plant could be increased to one of 12,500 hp., with practically no increase in the labor and supplies items. The main point, he claimed, is that with the surcharging system, the initial pressure is not increased, and that it does not put additional stresses on the engine, as such stresses depend solely on the initial pressure and not on the mean effective pressure. The cylinder walls do not get hotter with an increase of mean effective pressure from, say, 70 to 90 lb. per square inch. If the initial pressure is not over 400 lb. per square inch, the oil films in the bearings will be maintained, and if the cylinder temperature is maintained, as it should be, the engine operation should be exactly as safe as before the surcharging system is provided. In gas consumption 5 to 10 per cent. economy ought to be achieved with the surcharging, even deducting the power required for pumping the fuel and air supply.

He regarded waste heat boilers as of eminent importance and suggested that with 2 lb. of steam evaporated per kilowatt of the engine output, there would be available with the 120,000 hp. in gas engines at the Gary works, a possible increase in output of 10,000 kw. of electrical energy, obtainable from either low or high-pressure turbines. He referred to large waste heat boilers utilizing the waste of the blast furnace gas engines at the plant of the John Cockerill works at Seraing, Belgium, where the steam is generated at 8 atmospheres pressure and is tied into the regular steam lines. There is no special cost of installation in the case of the waste heat boilers.

In connection with the competition between the large gas engine and the steam turbines in steel plants, he referred to the paper he submitted to the American Iron & Steel Institute and printed at length in *The Iron Age*, May 29, 1913. The actual first cost is not so great as many were led to believe and he looked on the application of waste heat boilers as still to decrease the present cost.

The General Discussion

F. Zur Nedden, Goulds Mfg. Company, Seneca Falls, N. Y., referred to the last statement of the author's paper, in which it was suggested that perhaps the gas engine will have active competition through the development of the process of surface combustion in steam boilers along the lines of the discovery commonly credited to Prof. William A. Bone, Leeds, England. He referred to such a boiler at the Skinningrove steel works, England, where an efficiency of 90 per cent. is obtained in a steam boiler as compared with 65 to 70 per cent., ordinarily the case. This difference, he mentioned, would in the Pittsburgh district mean that one-third more power would be available than is now developed. In short, he thought it was well worth drawing attention to the Schnabel-Bone boiler, simply from the fact that it may economically threaten the existence of the gas engine.

Professor Fernald, admitting that he may be regarded one of these days as a crank on the centralization of power, intimated that a gas producer of 3000 to 4000 hp. capacity is a development of the immediate future, if present experiments with it are not in fact quite satisfactory. Such a producer he mentioned as being simple and satisfactory in operation and he expressed the belief that it is possible to manufacture units even larger than this. The centralized proposition is not a mere theory, he added, as there is now one large steam plant in operation at the mines and one large coal company is investigating the utilization of by-products in this country.

G. G. Crewson, Perth Amboy, N. J., mentioned the case of the installation of a waste heat boiler with a 750-hp. gas engine. Although the gases from the engine were 750 deg. F. in temperature, they were not cooled below 480 deg., this in spite of the fact that the boiler was clean. Instead of securing 2 lb. of steam per engine horsepower, mentioned by Professor Langer, the performance was 1.6 to 1.7 lb. Mr. Crewson explained that there was about 1000 sq. ft. of surface in the boiler, arranged after the fashion of a water-tube boiler.

C. J. Bacon, steam engineer of the Illinois Steel Company, South Chicago, mentioned that boilers built like a condenser were furnished as a regular part of the equipment of a gas engine by the Cockerill works.

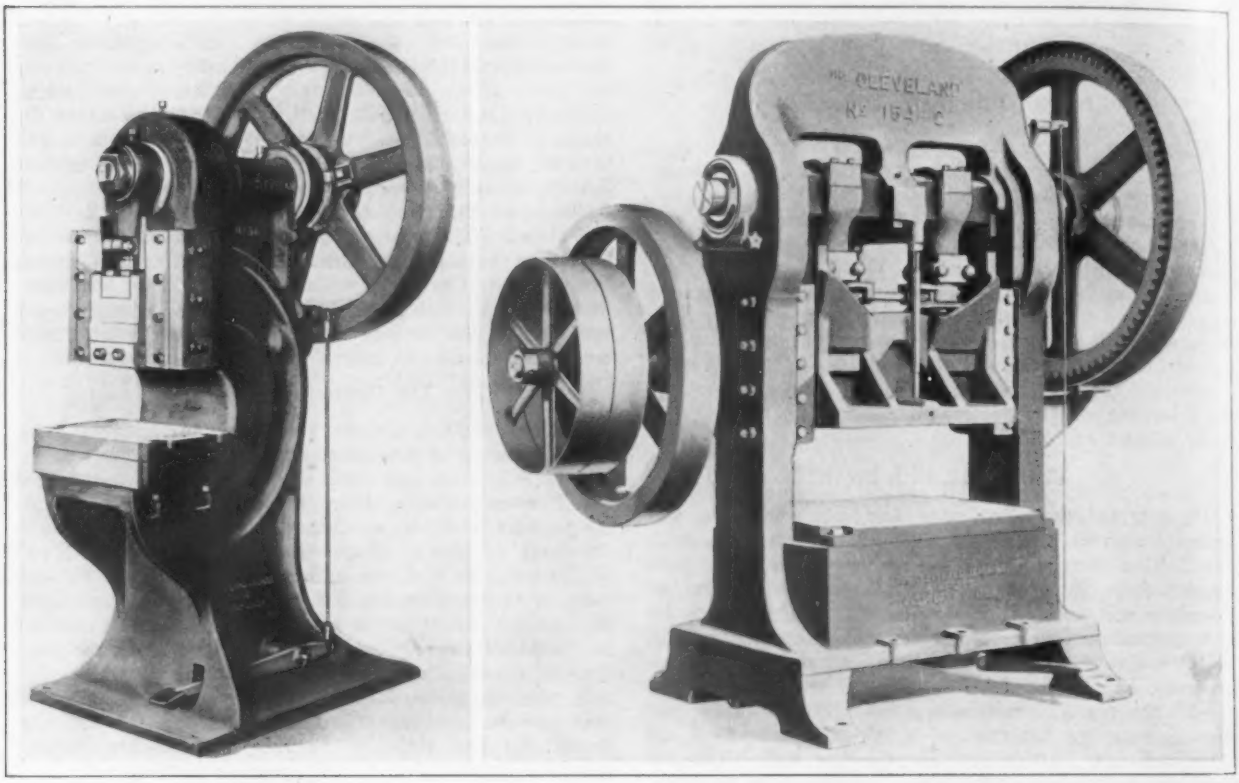
Concluding Remarks of Professor Langer

Professor Langer, in concluding the discussion, asserted that there is probably not one cylinder now in use without cracks, although these have been caulked. He believes the strains with the surcharging system are not the result of mechanical forces, but they are due to heating. His experience is that the temperature in a cylinder wall is higher with the surcharging system and the higher the temperature, all things being equal, the higher will the strains be.

With regard to the sizes of large engines, he said that the double-acting cylinder of less than 36 in. in diameter is not built in Germany and the limit per cylinder is 55 in. in diameter and 60 in. in stroke and a tandem engine of this size will carry a load of 3500 hp. or 6000 or 7000 hp. in a double unit. The size is limited chiefly by restrictions to shipment from works to point of use.

Two New Lines of Manufacturing Presses

The Cleveland Machine & Mfg. Company, Cleveland, Ohio, has recently brought out two lines of presses. One is a power punching press, while the other is of the double-crank geared type. Both of these machines are built in a wide range of sizes for handling a large variety of work.



Power Punching Press — Double Crank Geared Power Press

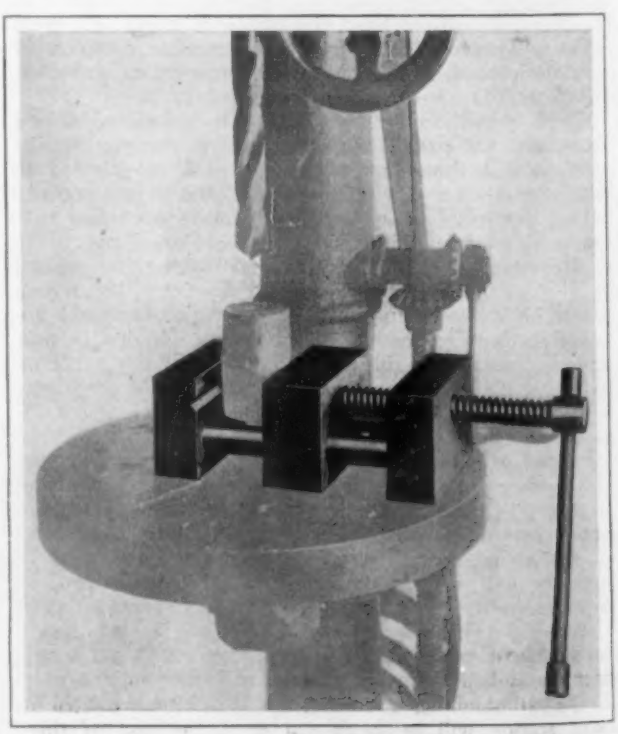
TWO PRESSES RECENTLY ADDED TO THE LINE OF THE CLEVELAND MACHINE & MFG. COMPANY

The power press shown at the left of the accompanying illustration is built in seven sizes, either plain or geared, and is especially adapted for use in the manufacture of hardware, locks, cutlery, typewriter and automobile parts and for trimming drop forgings. The face of the frame across the gibs is broad, thus permitting V gibs to be used and a large area on the bottom of the slide for supporting the upper die or punch to be provided. The connection is a steel casting with a bronze bushing. The diameter and length of the pin bearing, it is pointed out, are larger, and the adjustment is double that available where an eccentric adjustment is employed. Two clutch pins are regularly furnished in the flywheel, so that it is possible for the clutch to engage every half revolution.

In designing the double-crank geared power press shown at the right, strengthening the weak points was the special object sought. With this end in view the portion of the housing around the shaft opening has been reinforced 25 per cent. and the arch and bed have been made of extra deep section, while reinforcing of the slide is relied upon to eliminate practically all deflection when using large forming or embossing dies. Knockout rods are attached to the center bearing cap for ejecting formed and drawn parts from the upper dies. If desired, the beds of these presses are fitted wtih a drawing attachment that can also be used as a knockout device for ejecting work from blanking and forming dies. The presses are fitted with either a positive steel clutch or a multiple disk friction clutch that can be operated either automatically or by hand, the friction clutches being used principally on the larger presses and those having long strokes. A cast-iron guard is used to cover the gear and the pinion. These presses are built in nine sizes with shafts ranging from 3 to 12 in. and each size is built in several widths. The press illustrated is 49 in. wide between the uprights and the bed measures 36 x 48 in. The stroke of the slide is 6 in.

A Vise for Vertical Drilling Machines

An interesting type of vise for use on the tables of upright drilling machines has been brought out by E. A. Lueck Company, Milwaukee, Wis. By the use of this vise it is possible to drill a great variety of odd shapes and sizes of work, special emphasis being laid upon the fact that both round and rectangular pieces are held with equal security. The weight of the vise is relied upon to keep it in position on the table for doing all ordinary work. Where very heavy pieces are being handled it may sometimes be found necessary to employ straps and the long bolts which pass through the table.



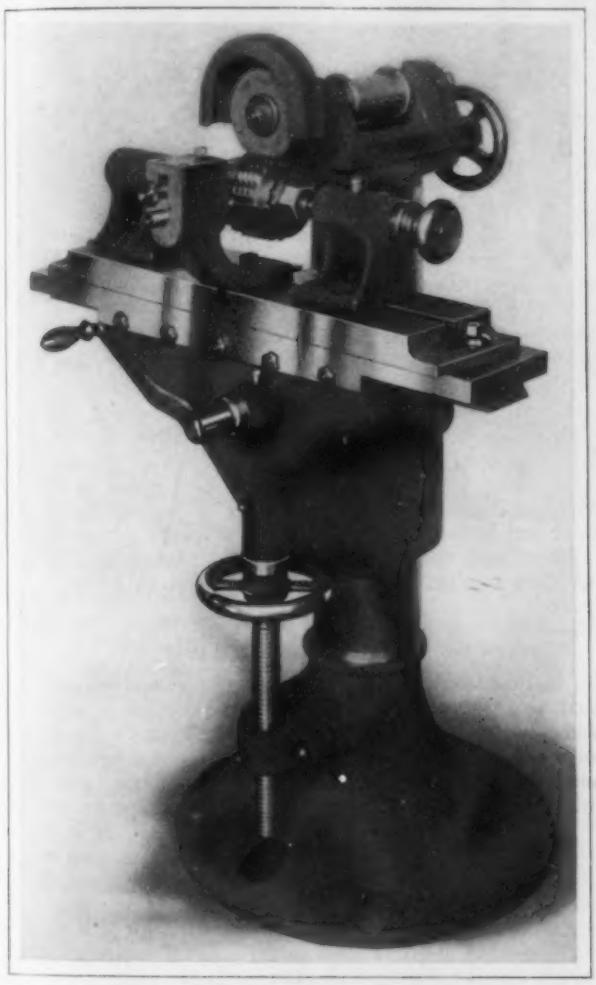
An Interesting Type of Vise for Use on the Tables of Upright Drilling Machines

All of the surfaces of the vise are machine finished. The jaws have an opening of 4⅞ in. and the over-all length is 12¾ in. The screw, which is 1 in. in diameter, has a phosphor bronze bushing, and a coarse pitch thread is used to secure quick opening and closing. For holding round work the vise jaws are cut with V slots at right angles to each other.

Special Hob and Cutter Grinding Machine

The Lees-Bradner Company, Cleveland, Ohio, has put out a hob and cutter grinding machine which is designed not only to sharpen hobs of the company's own particular manufacture, but any radially relieved cutter as well.

As it will be noticed from the engraving the machine has a knee with a vertical adjustment, supporting a



A Recently Designed Machine Capable of Grinding Hobs and Cutters of All Types

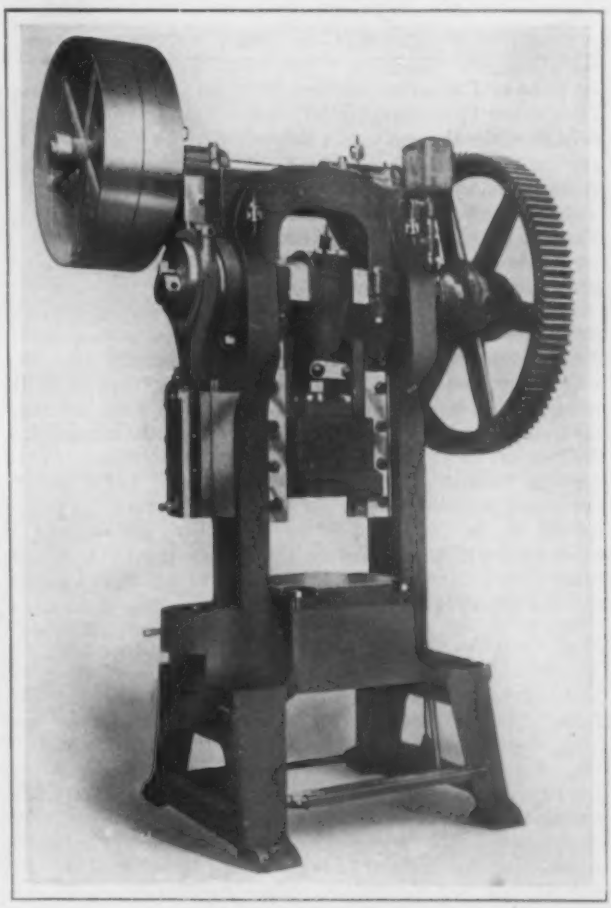
swivelling table that can be adjusted where angular grinding is necessary. There is a substantial arm for holding an indexing finger which has a screw adjustment. The wheel is mounted on the spindle in a cross slide, having adjustment for different diameters of work. The maximum swing of the machine is 8 in. and the maximum length on centers is 13 in. The total travel is 12 in. and the approximate weight is 700 lb.

In Norway 12 years ago there was practically no production of electricity worth mentioning, but the horsepower now generated or being developed is approaching half a million. The practice has been to harness existing waterfalls or to dam natural lakes. Johan Haare, of Trondhjem, has worked out a completely new project which consists in the construction of an artificial lake as a reservoir for a small river, the Surna, in Nordmöre. The course of the river is to be altered by leading the water through a tunnel in a mountain a distance of two miles, thus obtaining a considerable fall. The electrical power station will be located at the lower end of this tunnel. About 50,000 hp. will be made available.

Compact Design of Heavy Trimming Press

A new design of trimming press is being built by the Niagara Machine & Tool Works, Buffalo, N. Y., which is intended for trimming drop forgings and heavy sheet metal work and for use in the manufacture of hardware and automobile and bicycle parts. This machine differs materially from the general run of trimming presses, which heretofore have been built with the flywheel and pulley adjoining the main gear, and with an outboard bearing to support the overhanging part of the driving shaft. In this new press the flywheel, pulley and backshaft are mounted on top of the machine, and the outboard bearings are entirely eliminated, thus making the machine self-contained. In this way a minimum amount of floor space is occupied, and the press is accessible from all sides, thus enabling it to be placed as close as possible to the drop hammers, in conjunction with which it is used.

The motion of the press is controlled by an automatic jaw clutch, with a gravity releasing device. The inner slide has a dovetail recess to facilitate the mounting of trimming and forming dies. The outer slide receives its motion from an eccentric keyed to the main shaft and a steel pitman, and is used alternately with the inner one



A New Type of Trimming Press for Drop Forgings and Heavy Sheet Metal Work in Which the Outboard Bearings Have Been Eliminated

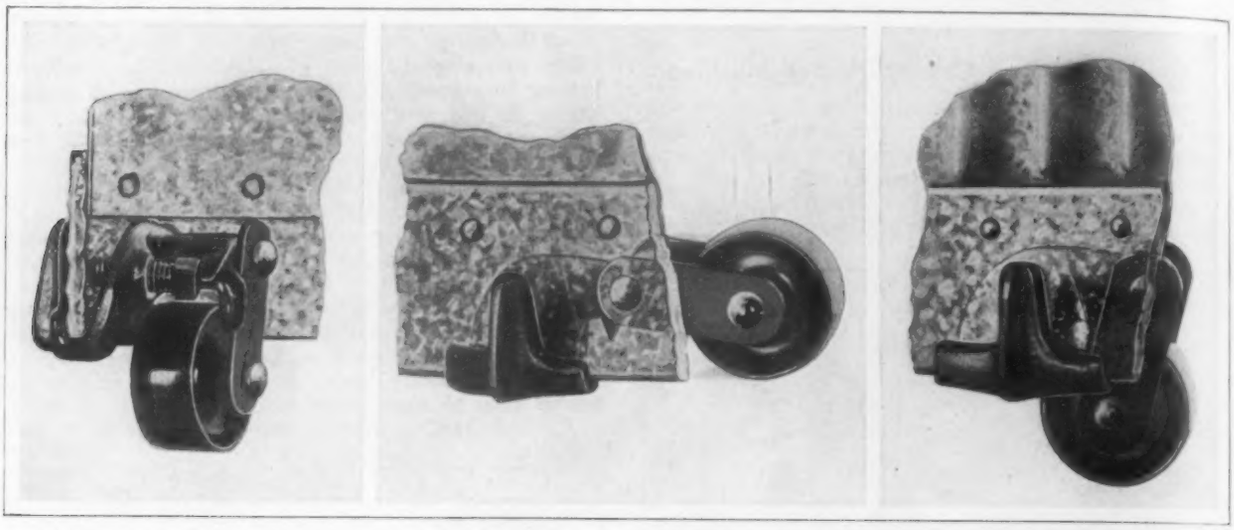
Both the outer slide and the bed have machined recesses so that adjustable holders with cutting-off tools can be attached, if desired.

These presses are built in different sizes, with single or double crankshafts and with either straight or gap housings. The weight of these machines varies from 5000 to 60,000 lb.

The plant of the Milwaukee Motor Company, at Thirty-second and Burleigh streets, Milwaukee, Wis., will be placed in operation January 1 by the Harris Bros. Company, Chicago, which bid in the property for $86,000 at receiver's sale late in November. W. J. Bennett, of St. Louis, who is representing the Harris interests in Milwaukee, states that the intention is to rehabilitate the property for sale. The product is unit power plants for automobiles and motor trucks.

Gravity Actuated Rollers for Shop Barrels

For use in connection with steel shop barrels, ash cans and other receptacles of a similar nature, the Edwards Mfg. Company, Cincinnati, Ohio, has brought out what are known as the Rockaway rollers. These rollers can be used to make the can into a two-wheel truck for movement around the plant; when not needed, they are turned upward underneath the can, giving a flat stationary barrel. The rollers, as shown at the left of the accompanying illustration, consist of a wheel which is mounted in a malleable iron bracket. This bracket is clamped to the projecting lower edge of the can by a set screw.

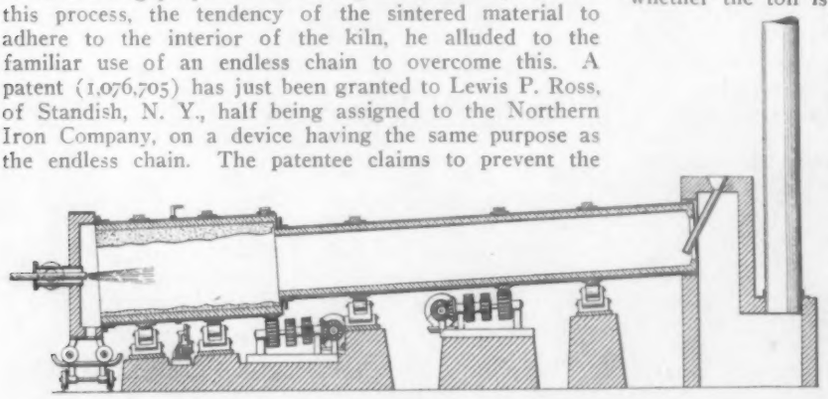


Views of a Recently Developed Roller for Shop Barrels Showing the Manner of Attaching It and the Two Positions Assumed by It

To bring the rollers into play, the can is tilted slowly and the force of gravity causes the rollers to drop down into the working position. The barrel or receptacle may then be pulled along by the handle. For throwing the rollers out of play, the barrel is tilted to rest one edge on the floor and is then brought down on the other edge, the rollers swinging up inside of the edge. When the can is flat the wheels are invisible. These rollers are fitted on the barrel, so that the distance from the handle to the points at which the rollers are applied is equal to the distance between the rollers, this arrangement being relied upon to enable the can to be moved freely without any drag.

A Patented Kiln for Nodulizing

In the paper on "The Treatment of Blast Furnace Flue Dust," read at the meeting of the American Iron and Steel Institute in Chicago, October 24, and printed in *The Iron Age* of November 13, Eugene B. Clark referred, among other methods, to the use of a rotary kiln for nodulizing purposes. In noting the main objection to this process, the tendency of the sintered material to adhere to the interior of the kiln, he alluded to the familiar use of an endless chain to overcome this. A patent (1,076,705) has just been granted to Lewis P. Ross, of Standish, N. Y., half being assigned to the Northern Iron Company, on a device having the same purpose as the endless chain. The patentee claims to prevent the usual comparatively uniform adhesion of fine ores or flue dust around the kiln lining, primarily by giving to the kiln or a section thereof, including the zone in which the substantial adhesion takes place, an oscillatory movement such that the accumulation upon the lining shall vary in thickness and approximate a crescent in cross-section. The result is, it is claimed, that when the kiln is turned so that the thickest portion of the accumulation is brought to the highest position it will fall by reason of its lack of support or the weakness of the lower section thereof. The patentee states that he favors dividing the kiln, in the way shown in the illustration, as being the more efficient, though this has not been tried out practically. The whole kiln has been operated successfully at Standish with an oscillatory movement, the only objection being minor mechanical difficulties due to handling so large a section, which would not be present with a divided kiln. An idea which Mr. Ross hopes to develop is to have a divided kiln, the lower or hot end being several feet larger in diameter than the upper or pre-heating section, and then to rotate the pre-heating section and oscillate the hot section in which the rings form.



Ross Divided Kiln for Nodulizing

Panama Canal Tolls

International Marine Engineering, New York, sharply criticises the announced method to be applied in assessing tolls on shipping passing through the Panama Canal. In a recent issue that journal goes into this matter in detail, showing that the method proposed, which is on the basis of net tonnage, is not practicable. It is stated to bear no direct ratio to the actual size of the vessel, as it varies with nearly every type of craft; it is not based on calculations sanctioned by any universally adopted standard; no two persons can calculate it exactly alike; fast passenger ships and other special types of ships will by this method have a decided advantage over slow freight ships which are the principal carriers of bulky cargoes by sea; with a vessel partly loaded, the question will arise as to whether the toll is to be assessed at loaded rates or at light rates.

The system proposed by the International Marine Engineering would fix tolls at a definite rate of so much per unit of the ultimate product of the length on the water line multiplied by the breadth of beam, and that in turn multiplied by the maximum draft of the vessel at the time she enters the canal. This system would assess all vessels passing through on a uniform basis and could be calculated by the representative of the Government in a very few moments, and the draft element in the calculation would assure that the vessel is only being charged for the exact amount of cargo at the time. This system would be in favor of the slow freighter which would pass through on the smallest canal charges owing to the fullness of the lines of such a carrier, while passenger vessels and those taking high priced freight would pay relatively higher tolls, owing to their finer lines.

American Society of Mechanical Engineers

The Human Factor in the Boiler Room, Lessons from Large Gas Engine Operation and Standardization of Machine Parts Leading Features

The annual meeting of the American Society of Mechanical Engineers, held last week in New York City, at the Engineering Societies Building, contributed some highly practical information concerning the construction and regulation of the large gas engine, directed attention to the need of a higher degree of intelligence in the boiler room than has ordinarily been the case, made quite a start toward the standardization of names and parts in machines and discussed the field of cast iron for metal working machinery. There was a wealth of technical information, requiring simultaneous sessions at different times, and the meeting was also conspicuous for the large part which the social side assumed. Some of the subjects discussed are, of course, not of primary interest to readers of *The Iron Age*, such as the problems of the textile and cement industries.

In the last issue mention was made of the presentation of the address of the retiring president, Dr. W. F. M. Goss, on Tuesday evening, December 2, which, as noted from the generous extracts printed in the last issue, was an important pronouncement on the present status of technical instruction and the need for men of large calibre in technical schools and the desirability of a closer union between the profession and the schools which are aiming to serve the profession. As in former times, the reading of the presidential address was followed by the announcement of the election of officers and a reception in the Society's rooms. The new president is James Hartness, president Jones & Lamson Machine Company, Springfield, Vt., and the additions to the council are as follows: As vice-presidents, H. L. Gantt, consulting engineer, New York; E. E. Keller, president Detroit Insulated Wire Company, Detroit, and H. G. Reist, mechanical engineer, General Electric Company, Schenectady, N. Y. As managers, Prof. A. M. Greene, Jr., Rensselaer Polytechnic Institute, Troy, N. Y.; John Hunter, chief engineer, Union Electric Light & Power Company, St. Louis, and Elliott H. Whitlock, factory manager, National Carbon Company, Cleveland. William H. Wiley was re-elected treasurer.

JAMES HARTNESS

The new president of the American Society of Mechanical Engineers was born in Schenectady, N. Y., in 1861. In 1888 he became connected with the Jones & Lamson Machine Company, Springfield, Vt., serving successively as superintendent, manager and president, which position he now holds. He has invented numerous labor-saving machines, among them being the flat turret lathe and the lo-swing lathe, and 1910 he invented a turret equatorial telescope which allows the astronomer to make observations without being exposed to the cold. He is the author of "Machine Building for Profit" and "The Human Factor in Works Management."

Following a business session on Wednesday morning, some of the points which were reported in the last issue, one paper was discussed. On Thursday morning, December 4, there was a group of simultaneous sessions, one of these on general mechanical engineering topics, another on machine shop topics and a third on gas power problems. The afternoon of Thursday was given over to plant visitation. On Wednesday evening an address was delivered by John W. Lieb, Jr., New York Edison Company, on "Leonardo da Vinci, Engineer and Artist," and the formal acceptance of the Grashof medal awarded to George Westinghouse by the Verein Deutscher Ingenieure was arranged for. On Thursday evening was held the chief social event of the meeting, a dinner served after the German style, as the nucleus of a reunion of the participants in the summer meeting of the society, who were guests in Germany in June of the Verein Deutscher Ingenieure. No less than 499 joined in the celebration, which was followed by a lecture illustrated by lantern slides and covering some of the interesting points of the German trip, delivered by Worcester R. Warner. This was followed by a dance. On Friday morning was held the concluding session of the meeting, devoted to fire protection.

Among the noteworthy incidents of the meeting was the receipt of cablegrams which had been sent from different individuals and branches of the German Society of Engineers, including messages from Dresden, Mannheim, Berlin and Hamburg, and from Oscar von Miller, president of the German society, and also from the Deutsches Museum at Munich. Another was the announcement of the election to membership of Amos Whitney, who was described as 81 years young and the president of the Pratt & Whitney University, the Alma Mater of many of the members.

Meeting of the Gas Power Section

The gas power section, held on Thursday morning, December 4, under the chairmanship of Dr. F. R. Hutton, met to receive two papers: "A New Process of Cleaning Producer Gas," by H. F. Smith, secretary and general manager, Smith Gas Power Company, Lexington, Ohio, and "Present Status of the Large Gas Engine in Europe," by Prof. Paul Langer, of the Technische Hochschule, Aachen, Germany. Mr. Smith's paper, which was printed at length in *The Iron Age*, November 20, was read by Professor William T. Magruder, Ohio State University, Columbus. Prof. Langer's paper will be found on page 1332 of this issue. At the conclusion of the session, Professor Hutton intimated the possibility that, like other divisions of activities of the Society, gas power problems would perhaps hereafter be handled under a gas power committee, rather than having a section of the Society given over to this work. He also mentioned that a paper from Professor Junkers on his form of gas engines is likely to be available by the spring meeting of the Society.

Mr. Smith's paper, as it will be recalled, is devoted to a scheme of condensing tar vapor by passage of the tar-laden gas through a diaphragm of spun glass. In passing the diaphragm the tar particles coalesce into large drops which cannot be carried along with the gas current, and Mr. Smith, contending that the process is not one of filtration, advanced a number of theories as mentioned in *The Iron Age* in the issue referred to. Professor Hutton in inviting a discussion of this paper, suggested that in addition to the electrification theory advanced by the author, it might be of profit to consider the idea of the cohesion of particles, and Professor Magruder suggested as an alternative that some colloidal action might be offered in explanation of why spun glass, for example, and not mineral wool has something to do with the efficacy of the cleansing material.

H. F. J. Freyn, consulting engineer, Allis-Chalmers

Mfg. Company, Milwaukee, suggested that it might be of interest to know something of the power consumption of the system of cleansing, particularly as necessary in considering the adoption of the method on a large scale. Prof. Robert H. Fernald, University of Pennsylvania, had visited plants where the extractor was in use, in connection with his work with the Bureau of Mines investigation. As regards the power requirements, he noted that the operators at the plant claimed that less power was used than with ordinary centrifugal extractors using water—perhaps 25 to 30 per cent. less power. As yet, it did not appear that there was any periodic changing of the spun glass. In one case a change was made at the end of the first week and then the next change was not made until three weeks had elapsed, and then a third after six weeks. It would appear to him that there is some operating factor which comes in as governing the period, although in the particular plant in mind, the period seems to be lengthening. The tar obtained is so free from water, he said, that it has a commercial value, and in one case is credited at $1.20 per bbl. In answer to a question, he suggested that the cost of the spun glass is comparatively inexpensive, that in a single tee, perhaps 1 lb. of the spun glass sufficed. He mentioned a case where with a typical centrifugal tar extractor considerable difficulty had been found from tar in engines, which difficulty was not noted after two months' operation with the form of extractor described by Mr. Smith. That the kind of gas and perhaps the presence of tar had something to do with engine performance was indicated in a case where there was $1000 difference chargeable to cylinder oil, in favor of the use of natural gas against producer gas in a 4000-hp. engine.

The discussion following the reading of Professor Langer's paper is given with the paper.

The Session on Machine Shop Topics

One of the simultaneous sessions of Thursday morning, December 4, was given over to the sub-committee on machine shop practice, Fred H. Colvin, managing editor, American Machinist, chairman. Four papers were presented, followed by considerable discussion, especially on the two dealing with gears for machine tool drives and cast iron for machine tool parts.

Gears for Machine Tool Drives

This paper, which was printed substantially in full in *The Iron Age*, November 27, was presented by the author, John Parker, Brown & Sharpe Mfg. Company.

Wilfred Lewis, Tabor Mfg. Company, in a brief communication stated that he thought the paper would be much improved if the author had given more information regarding the pitches, face widths and numbers of teeth of the gears employed by the Brown & Sharpe Mfg. Company in the spindle drive of one of its largest milling machines which was mentioned in the paper.

John Riddell, General Electric Company, in a written discussion, emphasized that where cast gears are used some attention should be paid to the design, pattern making and casting. He mentioned the advantages of cloth pinions, the question of their substitution for cast iron being dependent upon whether the higher cost is justified by an increased quietness in operation. He stated that while his company sometimes ordered machine tools with gear boxes for the initial drive, when there was need for haste, the variable-speed motor was preferred to take the place of unnecessary gear boxes which were bound to make noise in time. For changes in feeds and for automobiles a gear box was perhaps necessary. He commended the use of electric motors on the feeds of large machine tools, which not only cut out a lot of gears but other mechanisms. He urged a more accurate system of indexing and a more accurate system of mounting the gears after they have been properly indexed and cut. If a gear is allowed the slightest play on the shaft it will run eccentrically and produce noise that cannot be eliminated.

J. William Neidhardt, Detrick & Harvey Machine Company, in opening the oral discussion, stated that the gears used in their machines are of heavy pitch and wide face, and it is his personal opinion that gears of narrower face width and smaller diameters would cause noise. It is the practice to avoid clash gears and to use two bushed gears running on a shaft, the engagement being controlled by friction clutches.

MATERIALS SPECIFIED FOR GEARS

Frank B. McMullin, Pennsylvania Forge Company, said that the material most generally specified was machinery steel having a carbon content of 0.2 to 0.3 per cent. that had not been heat treated or case hardened, and he considered the material containing the lower percentage of carbon the best. For sprocket work, steel with carbon ranging from 0.45 to 0.50 per cent. was used. In speaking of the Government specifications for 3½ per cent. nickel steel, he stated that it was difficult to meet the specifications, and he considered that nickel chrome steel was better than ordinary nickel steel for this purpose. For gears for use where the wear was heavy and the teeth could be of generous proportions, he considered a manganese steel the best, and cited a case of a boring mill which had hardened nickel chrome gears throughout, with the exception of the table ring. This was a high percentage manganese gear which was hardened before machining. He considered the scleroscope test unreliable.

Adolph L. DeLeeuw, Cincinnati Milling Machine Company, said that case-hardened steel was necessary for clash gears. In a milling machine, machinery steel was originally used and satisfactory service was obtained if the gears were not thrown in while the machine was running. In his opinion steel gears are used in place of cast iron, not because they were any better in the general run, but because perhaps in one case out of a hundred bad results are obtained with cast iron, and for that reason steel is substituted. The Lewis formula he regarded too conservative for cast-iron gears for slow drives up to 100 ft. per min., and said that he had obtained figures from 50 to 100 per cent. higher for gears ranging from 16 to 20 in. in diameter. He cited the case of the quick-change feed gears, where conditions could not be controlled after the machine is built, as one of the instances where steel had been substituted for cast iron, as here only one gear of a set or perhaps two might be used in a number of cases instead of having the work distributed over a number of gears, as was stated in the paper.

FOREIGN PRACTICE IN REGARD TO GEAR DRIVES

Harry Fred Lee, Orcutt Gear Grinding Company, Ltd., explained that the gear box drive is being used in England, following the American practice. The gear box and single pulley drive is recognized as the drive of the future and many builders are using it. It was his experience that cast-iron gears do not hold up under heavy duty and run satisfactorily unless case hardened. One of the things that was especially required in machine tool construction abroad was quietness. The London police so require for buses, where the chain drive is used instead of a gear drive.

Elmer Harbson Neff, Brown & Sharpe Mfg. Company, considered the transition from cast iron to steel as a step in the inevitable development of machine tools, due to the demand for tools that could be used continuously. The manufacturer was interested in gear failures only as they affected the continuous operation of his machines, while the builder was anxious to investigate the failures from the standpoint of machine design. As it was important that machines run continuously, builders of machine tools had to use steel gears, the change having covered a number of years and being the substitution of something better, or, as he termed it, a case of the survival of the fittest.

Prof. Franklin DeR. Furman, Stevens Institute of Technology, said that if the wear was at the tips of the teeth the bulk of the work was done at the pitch line. Teeth of hard material will receive more punishment than those of soft, but are better able to resist the wear, by reason of the nature of the material employed.

AN INTERESTING EXAMPLE OF GEAR DRIVE

Charles R. Gabriel, E. W. Bliss Company, mentioned that the high-speed gearing in an automatic torpedo, having a turbine with a reduction gear of 10 to 1, consisted of one pair of spur and one pair of bevel chrome-nickel case-hardened gears, the spur teeth being ground after hardening. The engine, which developed 125 hp., transmitted 75 hp. through the spur gears at the rate of 7500 ft. per min., while the speed of the bevel gears was 1400

ft. per min., this rate giving a pressure of about 1770 lb. on the teeth. The case, he said, was not exactly the same as in a machine tool, although a number of torpedoes had made 700 runs of 8 min. duration. After the service mentioned, the gears showed no appreciable signs of wear. On account of the limited space the factor of safety was quite low, but this did not cause trouble as the gears were not subjected to shock, the load being balanced. The failures that have occurred were not caused by the gears, and in a number of cases where the torpedo struck an obstacle the propeller blades had broken off and the engine was not damaged. This apparatus was, of course, noisy.

The author in closing said that the variable speed and feed mechanism was the best thing that had been developed in machine tool construction. A constant-speed drive gave four times the efficiency of a cone pulley drive in a milling machine. In reply to Mr. DeLeeuw he said that the statement of conditions in quick-change feed gears was a general one.

Cast Iron for Machine Tool Parts

The second paper of the session on cast iron for machine tool parts was presented by the author, Henry M. Wood, Lodge & Shipley Machine Tool Company. This paper was printed substantially in full in *The Iron Age*, December 4.

A written discussion was submitted by Merwin McKaig which criticised the proportions of the so-called semi-steel mixture used by a heavy lathe manufacturer with reference to the percentage of sulphur given, stating that an iron with 0.8 per cent. of sulphur would be practically impossible to machine, and he would be glad to receive information regarding the way in which these castings were made if they were soft enough to machine.

Prof. A. Lewis Jenkins, University of Cincinnati, also in writing, stated that very low grades of iron might be employed for machine parts requiring stiffness if they were sufficiently heavy to resist the vibrations and deflections caused by the pressure on the tool. In his opinion it would be better to use a bar that was at least 24 in. between supports instead of the standard test bar measuring 1 x 1 x 12 in., to get more accurate deflection readings. Complicated castings should preferably be made from metal having a small shrinkage, thus decreasing the initial stress due to cooling, warping, etc., shrinkage cavities and some of the visible defects commonly seen on finished surfaces. While it is not an easy matter for some foundries to get a mixture that will produce desirable machining properties and have a grain sufficiently close to take a high finish, good results in this respect have been accomplished by the use of charcoal, certain grades of coke, steel scrap and ferroalloys. In the selection of castings the machine tool builder should, together with the machining and finishing properties, consider that property of the iron which resists deflection and upon which depends the stiffness and corresponding accuracy. The ultimate strength of the material is one of the minor considerations.

RESULTS OF ENGLISH EXPERIMENTS

Forrest R. Jones presented a written discussion containing the results of experiments made at the plant of Alfred Herbert, Ltd., England, on the durability of flat rubbing surfaces of cast iron. In making these experiments both surfaces were always of the same iron and each block was run back and forth some 84 miles on its own particular guide. After the test was completed the hardness was tested by drilling and the softest metal by the drill test showed the best wearing qualities, the scraper marks remaining visible on both the block and guide of the softer materials, while the oil used for lubrication remained clear. The harder blocks showed considerable wear and the oil soon became almost as black as ink. He also cited the experience of the Aermotor Company, of Chicago, where it was found that a thoroughly chilled cast-iron bearing would far outlast any of the other materials for the bearings of the horizontal shaft of the vane wheel of its windmills. Prior to the adoption of cast iron the bearings gave trouble by rather rapid wearing out. The iron used was chilled hard and white, similar to a carwheel, a steel or flour mill roll, or the mold-board and point of a plow, while the shaft was of ordinary machine steel. In the case of a series of tests which he himself had made, in which a piece of chilled cast iron rubbed against temperate spring steel as the mating bearing surface, it was found that the chilled iron still showed the marks of the fine-grained emery wheel that had been used to grind its friction surface, after a travel of 40 miles actual measurement and probably 50 per cent. more that was not measured.

Thomas D. West, West Steel Casting Company, Cleveland, commented in writing upon the change that a few years has made in the grade of iron being sought for machine tool castings. He also called attention to the absence of any mention of a varnish to coat chillers, and gave the formula for a varnish consisting of shellac, lamp black and alcohol. The use of a long, continuous chiller instead of the blocks mentioned in the paper was suggested and a form of chiller for the ways of lathe bed mentioned. In this chiller a space is provided for the insertion of water or air pipes to retard a drawing of the chill and also help the supporter from being heated to such an extent as to cause warping.

In opening the oral discussion, E. H. Mumford, Mumford Molding Machine Company, New York, said that he thought too much stress was laid on the strength of cast iron for machine tools. The chilling referred to in the paper is different from the chill in a carwheel. He stated that the chilling tendencies might vary with fuel changes, etc., and also expressed the opinion that the chronology of the chilling operation exerted a considerable influence.

IMPROVEMENTS IN CAST IRON

Bradley Stoughton, secretary of American Institute of Mining Engineers, congratulated the society on the method of preparation of the paper. He called attention to Mayari iron, which is not an alloy, but a natural ore containing both nickel and chromium when mined, and stated that this could be used in machine tool construction to advantage. With reference to Mr. McKaig's criticism about the percentage of sulphur he said that it should be 0.08 and not 0.8 per cent. He stated that the scleroscope test was used by the American Society for Testing Materials. The scleroscope test showed the resiliency, while the Brinell showed the elastic limit, but the former was useful for testing machine tool parts, and he believed that the unreliable results mentioned were in all probability due to the placing of apparatus in unskilled hands. The improvement that is being made in cast iron at the present time was touched upon, and he stated that there were two processes which were now reaching a climax that would render available cast iron that was better than malleable cast and much better than gray iron. Details of these processes would be available in one and six months, respectively. He said that steel should be used for parts requiring strength and cast iron for parts requiring weight. It was a mistake, he thought, to use cast iron for strength unless weight was required.

Mr. DeLeeuw spoke of the results of the English tests mentioned by Mr. Jones, showing that the wear of soft blocks was less than hard. He did not agree with the statement in the paper that the ideal casting was one that did not show any grain when finished. He considered graphite in castings as being beneficial in wearing and thought that a difference in the hardness of two parts in contact might be advantageous. The greater wear should be in the smaller of the two pieces in contact and this question must be kept in mind by the designer. He thought that chilled cast iron could be used to advantage for wearing surfaces and where there is a tendency to distort the castings as is the case of T-slots in machine tables.

Mr. Jones in continuing the oral discussion said that the experiments mentioned in his written discussion caused as much surprise to him as they apparently had to the members present at the meeting. In the case of the hard cast iron it had worn down as much as 1/32 in.

Standardizing Machinery

This paper, by Mr. Colvin, contains suggestions as to some parts of machine tools which may be standardized and points out the disadvantages of carrying this too far. The standardizing of the names of machine parts is more important than the names of the machines themselves. D. M. Wright, Henry & Wright Mfg. Company, in a letter to the author, suggested the formation of a committee of the society on machine tool nomenclature similar to the committee of the National Machine Tool Builders' Association.

Luther D. Burlingame, Brown & Sharpe Mfg. Company, agreed with the paper. The standardization should not

hold up the progress of design. He was pleased at the emphasis placed on motor standardization, which enables motors to be applied to machine tools without excessive fitting work. It was considered more important by his company to standardize the wrenches rather than the nuts to be used, and in a number of cases special nuts and bolts were made to avoid using a large number of wrenches. He thought the naming of parts was an important feature and stated that uniformity would help considerably in facilitating the manufacture of repair parts.

Mr. Carhart said that the suggestions appealed to the manufacturer of fittings. The inclination to name parts according to the work performed was in his opinion commendable and should be extended, provided the German extreme of compound names was avoided. He believed that the improvement in the names of parts could be brought about by the technical press.

Fred J. Miller, factory manager, Union Typewriter Company, said that standards in machine construction cannot be adopted unless a commercial incentive is provided. Standards should be established and the designer should refer to them. Members of the society's Committee on Standards, he said, should be chosen with reference to their acquaintance with special lines and recommend standards for various machines to the whole committee. It was not possible, in his opinion, to have all the machines conform at once. He cited the case of a manufacturer where from 25 to 30 taps were used in making one machine. After a conference newer models which required only seven taps were made and the various factories were asked to conform to the screws already in use in building subsequent machines. In the last model of the same machine only four taps were used. The publication of standards to be conformed to by manufacturers was suggested.

Management in the Boiler Room

Two papers were read which served to call special attention to a generally admitted need of higher grade men in the boiler room. One was presented by Walter N. Polakov, Philadelphia, and the other by J. W. Parker, of the Detroit Edison Company, Detroit. The former paper entitled "Task Setting for Firemen and Maintaining High Efficiency in Boiler Plants," is in a small part as follows:

For practical guidance the fireman needs at least three instruments:

(*a*) Indicating steam meter.

(*b*) Draft gage.

(*c*) Indicator for the coordination of the condition of firing with the load carried by the boiler at any moment.

In his experience the writer found that the well-known General Electric steam flow meter of the indicating type could easily and satisfactorily serve the third mentioned purpose. The writer arranges on the dial of the steam flow meter an inside dial, as shown in Fig. 1, with numbers indicating the required thickness of fuel bed corresponding to the number of pounds of steam drawn from the boiler and a third dial with numbers indicating the draft which is necessary and sufficient to supply the required quantity of air for the combustion at a rate called for by the indicated steam demand. Thus, if the pointer, as in Fig. 1, shows that steam is flowing from the boiler at a rate of, say, 14,000 lb. per hour, the fireman will know that the figure 4 under the pointer on the middle scale means that a draft of 0.4 in. of water is needed and that the location of the pointer on the inner scale between the figures 6 and 7 calls for a thickness of fires of from 6 to 7 in.

The next information vitally important for the fireman is the frequency at which his furnace must be coaled to keep the fires in best condition. The method adopted by the Italian Navy is accepted by the writer as most satisfactory, consisting chiefly in bell signaling at intervals in proportion to the load carried by the boilers, which signaling is regulated by clock mechanism connected with a flow meter. For use in a boiler house where a number of batteries are fired independently and it is desirable to eliminate the variations of load among them, a modification of this method is devised to equalize the driving of each furnace. The counter of the feedwater weigher, supplying water to the entire boiler house, rings the bell every time a certain number of thousand pounds of water is fed to the boilers, thus giving notice to the firemen that an adequate number of shovelfuls must be thrown into each furnace. This number is easily determined since the weight of a shovelful of coal is known and the rate of apparent evaporation at the given condition of firing is a constant.

Figuring a Fireman's Efficiency

The writer introduced, over a year ago, a method of obtaining a complete record of firemen's performance and their efficiency at the central station at Warrior Ridge, Pa. It requires the following record data:

Coal records from store issue tickets and coal passers reports compiled every eight hours.

Heat value of fuel determined by bomb calorimeter and value of coal in B.t.u. known for each coal pocket.

Amount of water fed to boiler (banked boilers fed separately) ascertained for the same periods.

Temperature of feedwater recorded.

Steam pressure recorded.

Degrees of superheat recorded.

These data are turned over to the station clerk who determines: actual evaporation ratio during each watch or per each man; equivalent evaporation during each watch or per each man; efficiency of steam generation per watch or per each man; cost of fuel per 1000 lb. of steam per watch or per each man.

He then enters the results of computation on a daily power plant report form. The whole procedure takes on the average 18 min. of the clerk's time, for whom, incidentally a specific task is assigned and sufficient hourly bonus offered for its fulfilment.

Every case of failure on the part of any fireman to secure on his watch the combined boiler, furnace and grate efficiency of 70 per cent. or above is immediately investigated by studies of other records and recording charts of

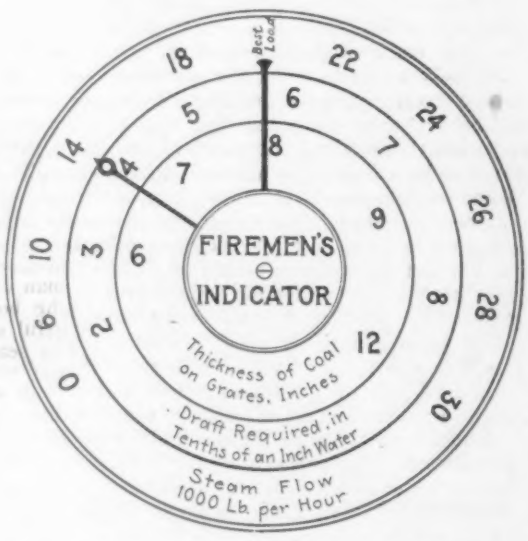

Boil. Load
FIREMEN'S
INDICATOR
Thickness of Coal on Grates, Inches
Draft Required in Tenths of an Inch Water
Steam Flow 1000 Lb. per Hour

Fig. 1—Dial of Steam Flow Meter with Special Scales for Use as Fireman's Indicator

draft, temperature of escaping gases, nature of boiler charts of draft, temperature of escaping gases, nature of boiler refuse, etc., and if no reason can be found there, an examination of the physical condition of equipment and apparatus is made. The result of this investigation is recorded on a form for cause of lost bonus, Fig. 2. This method is particularly valuable and outside of its direct advantages provides an additional and continuous training of the men in careful observation of harmful factors of the slightest nature.

Then by means of complete and trustworthy records the firemen are informed as to results of their work before they come back for the next watch, see Fig. 3, and moreover, while they are proceeding with their work, they have in addition to the instruments indicating the condition of firing, continuous information as to results they are accomplishing up to any moment of their watch. This is accomplished by having coal weighing and water metering so balanced that an even number of dumps of feedwater and dumps of coal indicates that the ratio of evaporation (superheat, pressure and feed temperature being as specified), is on the safe side of the requirement. The record of attainment of the task by firemen is kept in the manner devised by H. L. Gantt. While the May record showed only 68.7 per cent. efficiency of boiler and grates of the whole plant, the August month on this record

9	6	13
MONTH	DAY	YEAR

I HAVE INVESTIGATED AND REPORT BELOW THE CAUSE OF LOST BONUS

DEPT. Electr.
DISTR. Warr. Ridge

BY O. Hawn ON JOB Firing

CONDITION Draft was set wrong

Due to leak in draft gauge

RESPONSIBILITY IS ALLOCATED TO Maintenance Man

REMEDY ATTENDED TO BY ME Ordering Repair

S. D. Port
SIGNED

9	12	13
MONTH	DAY	YEAR

I HAVE INVESTIGATED AND REPORT BELOW THE CAUSE OF LOST BONUS

DEPT. Electr
DISTR. Warr. Ridge

BY D. M. Pope ON JOB Firing

CONDITION Extra boilers were shut down after midnight.

Unexpected load came, too high rate of firing.

RESPONSIBILITY IS ALLOCATED TO Switch-board operator

REMEDY ATTENDED TO BY ME Reprimanded

S. D. Port
SIGNED

Fig. 2—Examples of Form Used for Records of Cause of Lost Bonus

showed the efficiency of 73.1 per cent. The number of day-men falling short on the task is steadily reducing.

More Comforts in the Boiler Room

While engine rooms not infrequently offer very pleasant and sanitary surroundings, boiler houses, the most important part of any plant, are so built as to make them unbearably cold in winter and uncomfortably hot during the summer; ventilation apparently serves either to fill the lungs with coal dust or to chill the perspiring men after cleaning their fires. Lighting is an unusual luxury, so that after looking into the furnace no man could read his gages or examine anything around the boiler. Good drinking water is rarely provided, and restful seats with backs (seats without backs are equal to no seat at all) were never found by the writer in any boiler house. Yet the mere fact that the firemen, if provided with seats having backs, can get through the cleaning of fires in 18 min. per 100 sq. ft., while without them they consume at best 24 min., apparently should convince any unbiased mind.

The absence of an elementary condition of comfort in a working place where the men spend the better part of their lives is more harmful to the employers than to the employee. The petty annoyances and feelings of discom-

DAILY BONUS SLIP

CHARGE

DATE September

NAME J. Dearing NO.

DISTRICT - PLANT Warrior Ridge

HOURS DAY WORK	4
HOURS BONUS WORK	4
HOURS BONUS EARNED	1
TOTAL HOURS FOR DAY	5

REMARKS 71.8% - 4 hrs. firing on 3rd shift,
4 hrs. passing coal for sick coal passer.

SIGNED S. D. Port

Fig. 3—Form of Daily Bonus Statement to Fireman

fort divert the attention of the men from the performance of their duty to means of avoiding the annoyance or harm. Steady attention on the part of the fireman is much more important than is generally realized.

The Personnel and Fireroom Devices

Mr. Parker's paper reported on the operation of the nine 2365-hp. boilers now in use in the Delray power house in Detroit. It was in a measure, an answer to adverse criticism which has been made on the use of such large single units, but it paid considerable attention to fireroom personnel, to automatic control of both air and fuel and included maintenance costs. What Mr. Parker had to say was in part as follows:

The whole idea is to employ the most expert firemen it is possible to develop, and give each man control of the burning of a very large amount of coal. It is economical to employ a fine type of man and pay him an expert's pay. The present first-class fireman's pay is 40 cents an hour and he is well treated as to vacation and sick leave. These men are given the benefit of whatever boiler testing is done, and a force of firemen is being built up that can obtain remarkable results with their fires. They are acquiring an intelligent working understanding of the combustion of coal. At the same time the unit cost of firing will be unusually low.

At the end of each firing aisle is mounted a large pilot steam gage. The dial is graduated in divisions of 1½ in. on its circumference but with no figures, and each scale division registers 1 lb. per square inch. It is marked at just what point on this sensitive gage the boiler safety valves will lift and the steam pressure is carried accordingly. On the same gage board with the pilot gage are a clock and the dial of a load indicator, operated from the switchboard gallery, indicating the load on the entire plant in kilowatts. In handling his fires, the fireman is guided in the first place, of course, by steam requirements as shown by the pilot gage and a steam flow meter. The air pressure under the fire and the stoker speed are controlled by hand. Indicating dial tachometers are being installed on the stoker shafts, so that the stoker speed for a given load may be watched carefully.

As to furnace conditions, the firemen must judge by the CO_2 recorder, by the amount of air pressure necessary for any given boiler load, and by no means least of all by the color of the gases as they tumble over the first baffle and enter the top of the superheater pass. A reflecting observation device for this is at present being tried out, which allows the fireman to look into this boiler pass from a position near his gage board, instead of, as now, being dependent for this valuable indication on observation by the water tender or foreman. It is not desirable to substitute an automatic air and stoker control if a better CO_2 chart cannot be shown thereby. The danger is that the fireman will rely on the automatic device, rather than study conditions and control his fire intelligently. With the present hand control, excellent furnace conditions are beig obtained and held.

General Discussion

Dr. D. S. Jacobus, advisory engineer, the Babcock & Wilcox Company, believed that bonuses should not be given to the fireman alone but to the whole organization in that department, if given at all. The opinion was expressed that the time was coming when every large power plant would have a combustion engineer, a technically trained man, in charge of the fire room.

Considerable attention was paid to the value of the carbon dioxide gas recorder. I. E. Moultrop, mechanical engineer, Edison Electric Illuminating Company, Boston, considered the carbon dioxide gas instrument as not so important as it was formerly thought, and R. D. DeWolf, Rochester Railway & Light Company, Rochester, N. Y., claimed that it was sufficient to rely on the records of coal, water and steam generation. Edward Uehling, president Uehling Instrument Company, Passaic, N. J., said that the trouble with the use of the recorder is that as a rule there is no one responsible for it, and sometimes only one is installed in a large plant, so that dependence on it is not regarded as essential whatever. Prof. William Kent regarded the carbon dioxide recorder as a necessary evil, but pointed out conditions where it becomes an important indicator, although what is really needed is an oxygen meter; in short, the carbon dioxide record is not always a positive index of a satisfactory state of combustion.

R. P. Bolton, consulting engineer, New York, in referring to the large boilers considered that success with them lay in their large combustion spaces. Incidentally he felt that the big boiler had paved the way for intelligence in the boiler room. He described some investigations indicating how the carbon dioxide recorder may sometimes be getting the record of reverse currents.

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The Expense of Protecting the Future

While the Administration has it that the business men of the United States are being given "the new freedom," they spend so little time rejoicing in the fact that they have time to reflect that business conditions are changing in other respects. Mining and manufacturing companies find that the expense of protecting their future operations tends to become greater than present returns will carry. Business is in a state of flux in this respect, and not all the changes are due to the policies now being carried out at Washington. For instance, it was quite a number of years ago that Connellsville coking coal acreage rose to very high prices, exceeding $2000 an acre in a number of sales. Then it developed that a coke making company was not warranted in carrying an acreage sufficient for 15 or 20 years of operation, for the price of coke did not permit setting aside enough money to cover both exhaustion and interest charges. The return to the $1000 an acre level was signalized by the purchase of a large acreage by the United States Steel Corporation in the late spring of 1911 at approximately that figure. Since that interesting transaction sales have not been of sufficient volume to fix the market level for large acreages. It was clearly shown that conditions did not warrant an operation in carrying a large acreage if bought at a high figure. The drop in the Connellsville coke market in the past few months lends additional point to that view.

While the receivership of a prominent Pittsburgh district coal company, arranged within the past week, is not attributed solely to the carrying of a larger investment in mining plant and acreage than conditions in the coal industry warrant, the case suggests the difficult position in which a coal mining company is placed. If it endeavors to mine coal with a minimum investment in plant its current costs per ton are high and its competitive position is not good. If it goes in for the most modern and expensive plant, the plant outlay itself is large, and to avoid a large annual depreciation charge against it a large coal acreage must be carried, to insure a long life. But in this latter case, if the current cost of production is low the interest charges become correspondingly high. The determination of what equipment should be provided, instead of being the scientific problem so frequently assumed, becomes one of guesswork, practically a gambling upon the market of the future. The most poorly equipped plant may get along comfortably while the best equipped one has difficulty.

In the steel industry it is also unfortunately true that the proper investment in raw materials and in equipment to insure profitable operation over a series of years is a matter of guesswork. The "new freedom" distinctly promises as its striking benefit a keen competition in the present, and this competition makes it more difficult for the competitors to provide for their future profitable operation. For the moment, the concern with the smallest reserves in ore and coal, and the plant which involves the lowest interest charge, may possibly find itself the best fitted for indulging in the current competition. The manufacturers who have better fixed themselves may be discouraged from going farther in the same direction. Temporarily the buyer is given the price competition for which he is thought to yearn so earnestly, but what will be the condition of industry a decade hence?

It is easy now to look back and see that the appre-

hensions of iron and steel manufacturers a few years ago, as to the future supply of ore, were greater than they should have been. Investments in ore, while valuable, have not proved altogether as priceless as some optimists assumed. Whether there will be the same experience in coal acreage remains to be seen. There are undoubtedly some points of similarity.

It is not necessarily unsound economically that the market value of undeveloped minerals should be depressed, if the minerals cannot in the natural course of events be utilized for many years. If the original holder keeps them he bears the burden himself, but if a mining or manufacturing company acquires them, there is the tendency to put the expense upon the consumer, and this is a general tax upon consumption by keeping the price of the final commodity higher than it otherwise would be.

In regard to plant investment the same cannot be said. It is economically unsound to fasten conditions which discourage manufacturers from investments which promise reduction in cost, fearing that their industry will not be prosperous enough to employ the added plant. In the steel industry in particular there has been a great change—a constant trend toward the elimination of direct labor and the employment of invested capital. Such employment of invested capital, of course, really involves the use of labor, but with the distinction that the manufacturer ties up his capital and cannot discharge it. Let us say, as a crude illustration, that instead of choosing to pay 100 men their daily wages for the next five years, he invests in a machine which will do the work, at a somewhat less interest and depreciation cost than the wage cost would have been. Under adverse conditions he could have discharged the men, but the machine he cannot return to the maker with a demand for an adjustment.

As the expense of manufacturing a finished steel product becomes each year more in the direction of employing capital in fixed plant, there should be given year by year a greater assurance that the plant will have a chance to continue productive and thus make its proper return. According to the current opinion of many, the present trend of affairs is not in the direction of continuously increasing that assurance.

Iron Ore Uncertainties

The ending of the greatest season in the history of the Lake Superior iron ore trade at a time when pig-iron production is rapidly receding suggests again the capacity of the American iron trade for reversals of form. One year ago, after a new shipping record had been made, the total lake and all-rail movement being 48,200,000 tons, against close to 49,900,000 tons for this year, the bulk of the ore sales for 1913 had been made. Today no ore has been bought for 1914 and the prospects are that a number of weeks will elapse before furnace companies will entertain the idea of buying for the year beginning May 1, 1914. This year's experience is not the first in which the buyers of Lake Superior ore have found before four months' shipments have been made on their contracts that they were in the midst of a down swing, facing a period of contracting business and further declining prices. Some of them who, under the influence of the very favorable prognosis common a year ago, bought heavily at prices 65 to 85 cents above those of 1912, now find themselves with ore that will carry them well into the second half of 1914. Others are now taking satisfaction in the conservative purchases they made and in their refusal to be stampeded by the suggestion that the labor supply on the Lake Superior ranges might not be sufficient to meet the demand for ore.

Naturally the good prices of this year have been an incentive to get down every ton of ore contracted for, and the 50,000,000-ton mark which the Lake ore trade has long had for its goal was more closely approached than seemed likely two months ago. It is quite evident, moreover, that but for the interruptions due to the upper lake dock strikes and the signals of recession in the steel trade that were flying before the end of the summer, additional shipments would have been made, carrying the season's total well beyond 50,000,000 tons.

Even at the lower prices which it is conceded will prevail for Lake ores next year furnacemen are expected to cut down their 1913 purchases very materially. The 1914 situation may prove to be somewhat like that of 1911 after the reactionary conditions created by the strong buying of finished steel products in late 1909 and early 1910 for the rebuilding of the country's stocks. It is a question whether the mining companies will go back to the basis prevailing in 1912, when non-Bessemer ores sold at $2.65 to $2.85 against $3.40 to $3.60 this year. But, as was pointed out in a discussion of the iron ore outlook in *The Iron Age* of September 4, 1913, page 514, the supply of ore that will be offered on the general market promises to increase, while the pig iron output of 1914 is certain to fall much short of the 31,000,000 tons and over now indicated for 1913.

The Liquidation of Labor

The new attitude of employers toward labor is noteworthy. Prior to 1907 the development of a depression in trade was speedily followed by reductions in wages. Nearly every employer up to that time had been educated to believe that when the demand for his product shrank heavily it was necessary to reduce the cost of labor for the purpose of enabling him to continue the struggle for business. Of course, labor was reduced in all competing establishments, and the net result, so far as gaining an advantage, was nugatory. In the past six years, however, conditions have been radically different. Whether the change had its inception in politics or not is immaterial, but the fact is apparent that since 1907 wage rates in this country have only varied with improvements in trade. When business has grown larger, wages have advanced, but they have not receded with diminishing business.

Employers are meeting the present depression by operating their factories on shorter time and are trying to keep as great a part of their force engaged as possible, rather than either discharging large numbers of men or reducing wages. It appears now inevitable that many more men must be laid off, as work is steadily decreasing. Possibly the liquidation in labor that has been so long predicted by economists, and which has so far failed to materialize, may come about through the efforts of the unemployed to secure work. It has been known to happen in past times of extreme depression that the unemployed have offered their services at much less than regular rates. A lowering of wages has developed in that way through the men themselves and not by aggressive action by employers.

The Club Idea in Factory Management

The club idea in connection with industrial management is gaining ground each year. In small communities it is very important that workmen be given the opportunity for wholesome amusement. Recruiting of shop forces must be to a large extent from populous centers, and many of these men soon tire of what to them is humdrum village life. Also they must have pleasant living places. In the cities contentment is increased where means are afforded for meeting on a common ground for pleasure and general advancement.

The factory dining room is the most frequent example of the club idea as fostered by employers. The employees are provided with a place to eat their meals at noon, or at night, in case a double shift is employed. Either means are furnished for warming contents of lunch baskets, or hot food is sold at the lowest possible prices. In one such dining room is a piano, which is often used by some employee to enliven the hour, and a public telephone booth is available for the use of all.

The factory boarding house is an ancient institution, but not in the form maintained at some progressive industrial plants. It has come to be a real club, with excellent sleeping rooms and very good food at a price regulated by actual cost. It has recreation rooms, with games, perhaps including a pool or billiard table, and with current periodicals and a library of entertaining books. As a rule, this sort of establishment is confined to plants located in remote communities or in places where the standard of every-day existence is not high.

The idea is extended in a very practical way to associations of employees, especially of those holding administrative positions, high and low, which have meetings at regular intervals devoted to topics connected with the work. Good speakers from outside the organization are heard from time to time, to inspire new and fruitful lines of thought. An occasional function in which wives and families participate helps to maintain a spirit of co-operative fellowship.

A very important side to the club idea is the opportunity given for the meeting of owners and managing officials with their subordinates, on a basis that cannot exist in working hours, when every one is presumed to be under the tension of producing. The occasional mingling at noon or after the day's work, when restraint has disappeared to some extent, at least, cannot but have the effect of cementing organization, especially in relieving the atmosphere of possible antagonisms due to misunderstandings.

Correspondence

He Needed No Chemist to Detect Copper in Iron

To the Editor: My thought in asking you to publish the accompanying letter is to show that although the early "ironmasters" of Pennsylvania did not have laboratories, and doubtless knew nothing about applied chemistry, they at least knew when their bar iron contained copper.

The spelling, capitalization, and use of capitals are the same as in the original. Spring House is in Montgomery County, Pa. Moselem Forge (Massillon) was on Maiden Creek in Berks County, near Reading, Pa.

B. F. FACKENTHAL, JR.

RIEGELSVILLE, PA., December 4, 1913.

Spring-House May 12th, 1787

Sir

I Recd. the Iron by Mr. Searfos accepted your Order & paid Mr. Shull part of the Money as he was going from Town & wish to have one ton more in the Coars of 10 Days there was not more than two sets of Hoops & they ar boath Heavy I therefore Claim in the Next 4 Sets, & Inclose a Bill & wish to have it from Pattons as I Suspect the Massillom Forge has Changed your Piggs as there is Copper in the Iron I Recd. Your Compliance will much Oblige.

Your Humble Servt.
John Roberts

To Richard Backhouse Esq.
Durham Furnace

The Eight-Hour Day

To the Editor: An interesting analysis of the eight-hour day schedule for shop or mill operation is afforded by the following figures:

	9-hour day	8-hour day
Total hours per week	168	168
Working hours	50	44
Sleeping hours per week	63	63
Transportation time	10 123	10 117
Recreation time	45	51

The above figures are based on the Saturday half-holiday plan. The significant point in this simple comparison is that whereas the nine-hour day calls for 50 hours of work as compared with 45 hours of leisure the eight-hour day leaves the employee with more unproductive or recreation hours than the hours in which he works, by more than 15 per cent. Such a schedule surely has nothing to recommend it from an economic standpoint while from the standpoint of the employee's own well-being its advantage is hardly less questionable.

ECONOMIST.

Machinery Trade Imposed Upon

The attention of the machinery trade is called to the fact that a man is now working a scheme in which he seems to have singled out machinery houses as his victims in endeavoring to have bogus checks cashed. We are advised that this particular individual, who claims a connection with an engineering concern in Columbus, Ohio, has successfully tried the scheme on a considerable number of members of the trade. He is of plausible address and at one time excellent connections, so that he is able to impress those on whom he calls with his apparent honesty and sincerity.

Shall German Steel Bounties Pass Unnoticed?

Section IV of the new tariff act, in paragraph D, prescribing the character of invoices to be made at consular offices of the United States in foreign countries covering merchandise sold for shipment to this country, directs that "all drawbacks or bounties received or to be received are shown therein." In section V of the act, paragraph E prescribes:

That whenever any country, dependency, colony, province or other political subdivision of government shall pay or bestow, directly or indirectly, any bounty or grant upon the exportation of any article or merchandise from such country, dependency, colony, province or other political subdivision of government, and such article or merchandise is dutiable under the provisions of this act, then upon the importation of any such article or merchandise into the United States, whether the same shall be imported directly from the country of production or otherwise, and whether such article or merchandise is imported in the same condition as when exported from the country of production or has been changed in condition by reason of remanufacture or otherwise, there shall be levied and paid, in all such cases, in addition to the duties otherwise imposed by this act, an additional duty equal to the net amount of such bounty or grant, however the same be paid or bestowed. The net amount of all such bounties or grants shall be from time to time ascertained, determined and declared by the Secretary of the Treasury, who shall make all needful regulations for the identification of such articles and merchandise and for the assessment and collection of such additional duties.

It is a question as to whether the bounties now given by German iron, steel and coal syndicates for the purpose of stimulating exportations do not come under the purview of the act as above set forth. It hardly seems possible that Congress, in its careful phraseology, intended to cover the bounty question so fully and explicitly, should have limited the operation of this provision to such bounties as are paid out of the treasury of a government, and

should not have intended to include bounties paid by associations within a foreign country. If any considerable quantity of German iron or steel should be imported into this country, the question of the correct duty on such products is one which can very properly be raised for judicial decision.

Iron Ore Shipments to Lake Erie

Amount on Lower Lake Docks December 1 Was 700,000 Tons Less than Last Year

Lake Erie docks held about 700,000 gross tons less of iron ore December 1 than was on the docks one year previous, the total being 9,350,500 tons as compared with 10,053,836 tons on December 1, 1912. Lake Erie ports received up to December 1 this year 38,573,797 gross tons of ore as compared with 37,026,426 tons during 1912. The figures for 1913 do not include receipts at Port Colbourne, Ont., which became an ore-receiving point toward the end of the season. Cleveland leads in the amount received during the season, having passed Ashtabula. This is due largely to the additional equipment provided by the new Pennsylvania handling plant in Cleveland, which was placed in operation early in the season of 1912, but was not pushed to capacity when the machinery was new. Ore receipts at Lake Erie ports to December 1, 1912 and 1913 were as follows in gross tons:

Port	1913	1912
Buffalo and Tonawanda	5,415,959	5,034,380
Erie	713,902	544,802
Conneaut	7,849,303	7,839,831
Ashtabula	8,295,900	8,135,251
Fairport	2,037,126	1,810,381
Cleveland	8,783,485	7,892,206
Lorain	3,717,178	3,774,816
Huron	687,484	540,586
Toledo	1,073,460	1,454,173
Total	38,573,797	37,026,426

Ore receipts to December 1 at some of the more important ports other than Lake Erie were as follows:

Port	1913	1912
Detroit	377,655	467,004
Indiana Harbor	434,116	514,946
Gary	2,365,550	2,087,846
South Chicago	5,150,512	4,818,754
Milwaukee	227,722	137,391
Sault Ste. Marie, Ont.	542,869	544,869
Point Edward, Ont.	255,138	320,794

In addition to the Lake Superior shipments by water amounting to 49,070,478 tons there was shipped from the Canadian port of Key Harbor 88,930 tons of magnetite ore mined from the Moose Mountain Range in Canada. During 1912 shipments from this range amounted to 38,867 tons. With the development of the property considerable further increase in shipments of Canadian ore is expected from year to year.

During the season of 1913 furnaces taking ore from Lake Erie docks received about 1,280,000 tons more than in 1912. Last year, 24,844,646 tons was shipped direct from vessels to furnaces between the opening of navigation and December 1. This year direct shipments from Lake Erie docks aggregated 26,125,758 tons. Ore on Lake Erie docks December 1, 1913, and previous years was as follows:

Port	1913	1912	1911	1910
Buffalo and Tonawanda	319,720	340,030	413,353	452 783
Erie	594,613	652,368	636.274	792.011
Conneaut	1,248,032	1,429,533	1,237,573	1,329,997
Ashtabula	3,190,554	3,336,865	3,295,862	3,287.816
Fairport	478,014	565,920	636,566	839,970
Cleveland	1,923,383	1,888,838	1,589,491	1,638.795
Lorain	794,704	902,166	*314,321	*259,448
Huron	441,542	385,811	344,371	375,118
Sandusky	2,471	2,471	2,471	17,728
Toledo	357,467	549,834	661,382	433,215
Total	9,350,500	10,053,836	9,131,664	9,426.881

*One dock not classed as shipping dock prior to 1912.

The value of all minerals produced in the United States in 1912, according to figures just compiled by Edward W. Parker, statistician, of the United States Geological Survey, reached the record-breaking total of $2,243,630,326. This is more than six times the value of the production in 1882, 30 years ago. During that period the population has not quite doubled, but the per capita output of the mines has increased from $7.27 to $23.47. In 1880 the total mineral production in the United States was valued at $364,000,000, while in 1912 the value of the pig iron alone was $120,000,000.

November Copper Production and Stock

The regular monthly report of the Copper Producers' Association for October shows the stock of copper on hand December 1, 1913, to be 47,929,429 lb., an increase of 15,363,047 lb. over that of the month previous. The November statement of the association compares as follows with that of October:

	November, pounds	October, pounds
Stock of marketable copper of all kinds on hand at all points in the United States at the first of the month	32,566,382	29,793,094
Production of marketable copper in the United States from all domestic and foreign sources in the month	134,087,708	139,070,481
Deliveries of marketable copper in the month:		
For domestic consumption	48,656,858	68,173,720
For export	70,067,803	68,123,473
Total	118,724,661	136,297,193
Stock of marketable copper of all kinds on hand at all points in the United States at the close of the month	47,929,429	32,566,382

The distinguishing feature of the report is the large falling off in domestic consumption during November. The total for the month is only 48,656,858 lb., a decrease of 19,516,862 lb. from that of October, which is the smallest in any month for nearly two years. The previous low figure was in January, 1911, when about 42,000,000 lb. was sold. Contrasted with these figures, the deliveries abroad were 70,067,803 lb., or 1,944,330 lb. in excess of the October foreign consumption. The production for November was 134,087,708 lb. as compared with 139,070,481 lb. in October, a falling off of 4,982,773 lb. The total consumption of 118,724,661 lb. was 17,572,532 less than that for October, due to the slump in domestic deliveries.

Two 20-Ton Electric Furnaces at Lebanon, Pa.

Arrangements have been completed for the building of the largest electric furnace steel plant in the United States. In addition to the large open-hearth plant of four 50-ton furnaces which, as announced in *The Iron Age* of July 3, 1913, the American Iron & Steel Mfg. Company, Lebanon, Pa., will build, this company has completed arrangements for building two 20-ton electric furnaces. They will be double-ring, single-phase Frick furnaces and are a new type of this inventor's design. The furnaces are to be furnished by the Siemens & Halske Actiengesellschaft, Berlin, Germany, through its American representative, Dr. Karl G. Frank, 90 West street, New York. The electric furnaces are to refine molten open-hearth steel and the product is to be rolled into the company's regular products. Much interest attaches to the development of this project, the nearest approach in size in this country being the 15-ton Heroult furnaces operated by the American Steel & Wire Company at its plant at Worcester, Mass., and the 15-ton Heroult furnace of the Illinois Steel Company at South Chicago, Ill.

Fewer New Incorporations

One of the most significant indications of declining business enterprise is found in the monthly record of new incorporations, which for some months have been running at the rate of less than half the volume of a year ago, says the Journal of Commerce, New York. Papers filed in the principal Eastern States with an authorized capital of $1,000,000 or over in November represented only $77,800,000. This is a decrease as compared with the same month a year ago of $76,400,000. This shrinkage must be attributed to disturbing legislative and industrial conditions at home, as well as to world-wide financial exhaustion. Charters taken out by other concerns with an individual capital of $100,000 or more in the past month, including other States than those of the East, bring the grand total up to $124,632,000, against $118,561,300 in the preceding month and $222,855,000 in November a year ago.

The Falls Rivet & Machine Company, Kent, Ohio, has filed a voluntary petition in bankruptcy in the Federal Court in Cleveland and asked that a receiver be appointed. The liabilities are placed at $94,903 and the assets at $229,666.

The Iron and Metal Markets

Somewhat More Inquiry

FORWARD BUYING STILL POSTPONED

Steel Corporation Statement Shows Small Reduction in Unfilled Orders

While the rate of rolling-mill and steel-works operations is less than that of a week ago, inquiry for some forms of finished steel has increased enough to bring out a note of hopefulness in some quarters. It is beginning to be realized that the 50 per cent. operation to which finishing mills have now come, on the average, is below the wear-and-tear line in consumption, and that while buyers wait, the country's needs are accumulating, as they have before in similar situations.

Pittsburgh is the source of whatever encouragement the trade has found and this is based largely on the fact that buyers of bars have been sounding the market to get at the basis of contracts for the first half of next year. There is also in all markets more inquiry for spikes, angle bars, tie plates and other track fastenings, indicating that a number of railroads are planning for a fair amount of track laying. One road is in the market for 30,000 kegs of spikes.

Prices of both pig-iron and steel products have settled further, but steel manufacturers are less willing to make concessions on hand-to-mouth business. They are more disposed to reserve their cuts for real buying like that of two years ago, and that sort is not yet in sight. Sellers, too, are not yet ready to put long-time contracts on their books on the 1911 price basis, which was $2 to $3 below today's market.

Prices on bars, plates and structural shapes—the three products that are commonly taken as the gauge of the market—have ranged between 1.15c. and 1.25c., plates and bars being commonly sold at 1.20c. and structural steel at 1.25c., Pittsburgh. The fabricating trade hears of some very low prices on recent contracts, some of these figuring back on the current basis for fabrication to 1.10c. at mill for plain material.

The Steel Corporation's statement, with its reduction of but 117,420 tons in unfilled orders in November as against 490,000 tons in October, shows again that these tonnage figures standing alone lack much of indicating the trend of the steel trade. On November 30 orders on hand were 4,396,347 tons; on October 31 they were 4,513,767 tons. Reduced output of mills is certainly not a good feature, yet it keeps the unfilled tonnage from falling. While the rate at which new orders were booked is not stated, tin-plate contracts for 1914 were a considerable factor.

One Eastern railroad has placed its rail order for 1914, but no details are given. The contracts of the New York Central and Pennnsylvania roads are still withheld. The Norfolk & Western has placed about 11,000 tons with two Eastern mills. Recent car buying includes 1000 steel hopper cars for the Lehigh Valley. Besides that for 2000 cars for the Wabash-Pittsburgh Terminal there are live inquiries for 4000 to 5000 cars.

Demand for semi-finished steel though small has not dried up. Several buyers are seeking to contract for moderate lots. Thus far $20, Pittsburgh, has been maintained by most sellers, but they are not anxious to contract ahead.

Pig iron markets, East and West, have been quieter, though there are evidences that a number of good-sized buyers are close to the point of contracting. Cleveland and Buffalo have been noteworthy for low-priced transactions in the past week.

At Pittsburgh there is inquiry for a total of 10,000 tons of basic iron, but steel works operations are on so reduced a scale that a price of $12.75 at Valley furnace does not stir up demand. In New England a 6000-ton order for basic iron is pending.

Furnaces are contracting slowly for their coke for the first half of next year. One sale was at $1.75 at ovens for 5000 tons a month, and in other cases $1.80 and $1.85 have been paid. Some producers have been standing for $2, but the blowing out of furnaces has been steadily turning the coke market in the buyer's favor.

German and British market reports are a shade more cheerful. Continental sellers of semi-finished steel and of bars are taking a firmer stand and the prospect of shipments to the United States, leaving out the Pacific coast which stands by itself, grows less. Efforts to import structural steel from Germany to this country brought out a price of 1.45c., delivered on the Atlantic seaboard, duty paid.

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics

At date, one week, one month, and one year previous.

	Dec. 10, 1913.	Dec. 3, 1913.	Nov. 12, 1913.	Dec. 11, 1912.
Pig Iron, Per Gross Ton:				
Foundry No. 2 X, Philadelphia.	*$15.25*	$15.50	$15.50	$18.50
Foundry No. 2, Valley furnace.	13.50	13.50	13.50	17.00
Foundry No. 2 S'th'n, Cin'ti....	14.25	14.25	13.75	17.25
Foundry No. 2, Birmingham, Ala.	11.00	11.00	10.50	14.00
Foundry No. 2, furnace, Chicago*	14.75	14.75	15.00	18.00
Basic, delivered, eastern Pa....	15.00	15.00	15.00	18.25
Basic, Valley furnace	12.75	12.75	13.25	16.50
Bessemer, Pittsburgh	15.90	15.90	16.15	18.15
Malleable Bessemer, Chicago*..	14.75	14.75	15.00	18.00
Gray forge, Pittsburgh.....	*13.90*	14.15	14.25	17.15
Lake Superior charcoal, Chicago	15.25	15.25	15.25	18.75
Billets, etc., Per Gross Ton:				
Bessemer billets, Pittsburgh	20.00	20.00	21.00	27.00
Open-hearth billets, Pittsburgh..	20.00	20.00	21.00	27.50
Open-hearth sheet bars, P'gh...	21.00	21.00	21.50	28.00
Forging billets, Pittsburgh	24.00	24.00	26.00	34.00
Open-hearth billets, Philadelphia	*22.40*	22.50	22.90	32.00
Wire rods, Pittsburgh.....	*25.00*	25.50	26.00	30.00
Old Material, Per Gross Ton.				
Iron rails, Chicago	*13.00*	13.50	13.50	17.25
Iron rails, Philadelphia.....	*15.50*	17.00	17.50	18.00
Carwheels, Chicago	12.00	12.00	12.00	17.00
Carwheels, Philadelphia	12.00	12.00	12.00	15.50
Heavy steel scrap, Pittsburgh....	*11.00*	11.25	11.50	14.75
Heavy steel scrap, Philadelphia	10.00	10.00	10.25	14.50
Heavy steel scrap, Chicago.....	9.00	9.00	9.50	12.50
No. 1 foundry cast, Pittsburgh..	12.00	12.00	12.00	14.50
No. 1 foundry cast, Philadelphia	*12.00*	12.50	12.50	15.00
No. 1 f'dry cast, Ch'go (net ton)	*9.75*	10.00	10.00	13.00
Finished Iron and Steel, Per Pound to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Bessemer rails, heavy, at mill...	1.25	1.25	1.25	1.25
Iron bars, Philadelphia.....	1.25	1.25	1.30	1.67½
Iron bars, Pittsburgh	1.35	1.35	1.40	1.70
Iron bars, Chicago	1.15	1.15	1.15	1.55
Steel bars, Pittsburgh.....	*1.20*	1.25	1.30	1.70
Steel bars, New York.....	*1.36*	1.41	1.46	1.86
Tank plates, Pittsburgh.....	1.20	1.20	1.25	1.75
Tank plates, New York.....	1.36	1.36	1.41	1.91
Beams, channels & angles, P'gh.	1.25	1.25	1.30	1.75
Beams, channels & angles, N. Y.	1.41	1.41	1.46	1.91
Skelp, grooved steel, Pittsburgh	*1.20*	1.25	1.25	1.45
Skelp, sheared steel, Pittsburgh.	*1.30*	1.35	1.35	1.50
Steel hoops, Pittsburgh.....	*1.40*	1.45	1.50	1.50
Sheets, Nails and Wire, Per Pound to Large Buyers:				
Sheets, black, No. 28, Pittsburgh	1.90	1.90	2.00	2.25
Galvanized sheets, No. 28, P'gh.	2.90	2.90	3.00	3.40
Wire nails, Pittsburgh	1.55	1.55	1.60	1.70
Cut nails, f.o.b. Eastern mills...	1.65	1.65	1.65	1.75
Cut nails, Pittsburgh	1.55	1.55	1.55	1.70
Fence wire, ann'l'd, 0 to 9, P'gh.	1.35	1.35	1.40	1.50
Barb wire, galv., Pittsburgh....	1.95	1.95	2.00	2.10

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

Coke, **Connellsville,**

Per Net Ton at Oven.	Dec. 10, 1913.	Dec. 3, 1913.	Nov. 12, 1913.	Dec. 11, 1912.
Furnace coke, prompt shipment..	$1.75	$1.75	$1.85	$4.00
Furnace coke, future delivery...	*1.80*	1.85	2.00	3.25
Foundry coke, prompt shipment.	2.50	2.50	2.65	4.50
Foundry coke, future delivery..	*2.60*	2.75	2.75	4.00

Metals,

Per Pound to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Lake copper, New York.....	15.00	15.00	16.25	17.75
Electrolytic copper, New York.	*14.37½*	14.62½	15.50	17.50
Spelter, St. Louis.....	5.00	5.00	5.15	7.20
Spelter, New York.....	5.15	5.15	5.30	7.35
Lead, St. Louis.....	*3.85*	3.95	4.20	4.20
Lead, New York.....	*4.00*	4.10	4.35	4.35
Tin, New York.....	*37.50*	38.50	39.50	49.25
Antimony, Hallett's, New York	*7.00*	7.10	7.25	9.50
Tin plate, 100-lb. box, Pittsburgh	$3.40	$3.40	$3.40	$3.60

Finished Iron and Steel f. o. b. Pittsburgh

Freight rates from Pittsburgh, in carloads, per 100 lb., New York, 16c.; Philadelphia, 15c.; Boston, 18c.; Buffalo, 11c.; Cleveland, 10c.; Cincinnati, 15c.; Indianapolis, 17c.; Chicago, 18c.; St. Louis, 22½c.; Kansas City, 42½c.; Omaha, 42½c.; St. Paul, 32c.; Denver, 84½c.; New Orleans, 30c.; Birmingham, Ala., 45c.; Pacific coast, 80c. on plates, structural shapes and sheets No. 11 and heavier, 85c. on sheets Nos. 12 to 16; 95c. on sheets No. 16 and lighter; 65c. on wrought pipe and boiler tubes.

Plates.—Tank plates, ¼ in. thick, 6¼ in. up to 100 in. wide, 1.20c., base, net cash, 30 days. Following are stipulations prescribed by manufacturers with extras:

Rectangular plates, tank steel or conforming to manufacturer's standard specifications for structural steel dated February 6, 1903, or equivalent, ¼ in. and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per sq. ft., are considered ¼-in. plates. Plates over 72 in. wide must be ordered ¼ in. thick on edge, or not less than 11 lb. per sq. ft., to take base price. Plates over 72 in. wide ordered less than 11 lb. per sq. ft. down to the weight of 3-16 in. take the price of 3-16 in.

Allowable overweight, whether plates are ordered to gauge or weight, to be governed by the standard specifications of the Association of American Steel Manufacturers.

Extras.	Cents per lb.
Gauges under ¼ in. to and including 3-16 in.....	.10
Gauges under 3-16 in. to and including No. 8.....	.15
Gauges under No. 8 to and including No. 9.....	.25
Gauges under No. 9 to and including No. 10.....	.30
Gauges under No. 10 to and including No. 12	.40
Sketches (including straight taper plates) 3 ft. and over	.10
Complete circles 3 ft. in diameter and over.....	.20
Boiler and flange steel	.10
"A. B. M. A." and ordinary firebox steel.....	.20
Still bottom steel	.30
Marine steel	.40
Locomotive firebox steel	.50
Widths over 100 in. up to 110 in., inclusive.....	.05
Widths over 110 in. up to 115 in., inclusive.....	.10
Widths over 115 in. up to 120 in., inclusive.....	.15
Widths over 120 in. up to 125 in., inclusive.....	.25
Widths over 125 in. up to 130 in., inclusive.....	.50
Widths over 130 in.....	1.00
Cutting to lengths, under 3 ft., to 2 ft., inclusive.....	.25
Cutting to lengths, under 2 ft., to 1 ft., inclusive.....	.50
Cutting to lengths, under 1 ft.....	1.55

No charge for cutting rectangular plates to lengths 3 ft. and over.

Structural Material.—I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles, 3 to 6 in. on one or both legs, ¼ in. thick and over, and zees, 3 in. and over, 1.25c. to 1.30c. Extras on other shapes and sizes are as follows:

	Cents per lb.
I-beams over 15 in.....	.10
H-beams over 18 in.....	.10
Angles over 6 in. on one or both legs.....	.10
Angles, 3 in. on one or both legs, less than ¼ in. thick, as per steel bar card, Sept. 1, 1909.....	.70
Tees, structural sizes (except elevator, hand rail, car-truck and conductor rail).....	.05
Channels and tees, under 3 in. wide, as per steel bar card, Sept. 1, 1909.....	.20 to .80
Deck beams and bulb angles	.30
Hand rail tees	.75
Cutting to lengths, under 3 ft., to 2 ft. inclusive.....	.25
Cutting to lengths, under 2 ft., to 1 ft. inclusive.....	.50
Cutting to lengths, under 1 ft.....	1.55

No charge for cutting to lengths 3 ft. and over.

Wire Rods.—Bessemer, open-hearth and chain rods, $25 to $25.50.

Wire Products.—Fence wire, Nos. 0 to 9, per 100 lb., terms 60 days or 2 per cent. discount in 10 days, carload lots to jobbers, annealed, $1.35; galvanized, $1.75. Galvanized barb wire and fence staples, to jobbers, $1.95; painted, $1.55. Wire nails, to jobbers, $1.55. Prices of the foregoing wire products to dealers, in carload lots, are 5c. higher. Woven wire fencing, 74½ per cent. off list for carloads; 73½ off for 1000-rod lots; 72½ off for less than 1000-rod lots.

The following table gives the price to retail merchants on fence wire in less than carloads, with the extras added to the base price:

Plain Wire, per 100 lb.

Nos.	0 to 9	10	11	12 & 12½	13	14	15	16
Annealed	$1.55	$1.60	$1.65	$1.70	$1.80	$1.90	$2.00	$2.10
Galvanized ..	2.00	2.00	2.05	2.10	2.20	2.30	2.70	2.80

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card on steel pipe in effect from October 27, 1913, and iron pipe from June 2, 1913, all full weight:

Butt Weld.

Steel. Inches.	Black.	Galv.	Iron. Inches.	Black.	Galv.
⅛, ¼ and ⅜.....	73	52½	⅛ and ¼	66	47
½	77	66½	⅜	65	46
¾ to 3	80	71½	½	69	56
			¾ to 2½	72	61

Lap Weld.

2	77	68½	1¼	56	45
2½ to 6	79	70½	1½	67	56
7 to 12	76	65½	2	68	58
13 to 15	53	..	2½ to 4	70	61
			4½ to 6	70	61
			7 to 12	68	55

Reamed and Drifted.

1 to 3, butt.....	78	69½	1 to 1½, butt.....	70	59
2, lap	75	66½	2, butt	70	59
2½ to 6, lap.....	77	68½	1¼, lap	54	43
			1¼, lap	65	54
			2, lap	66	56
			2½ to 4, lap.....	68	59

Butt Weld, extra strong, plain ends.

⅛, ¼ and ⅜.....	68	57½	⅜	63	52
½	73	66½	½	67	60
¾ to 1½	77	70½	¾ to 1½	71	62
2 to 3	78	71½	2 and 2½	72	63

Lap Weld, extra strong, plain ends.

2	74	65½	1½	65	59
2½ to 4	76	67½	2	66	58
4½ to 6	75	66½	2½ to 4	70	61
7 to 8	68	57½	4½ to 6	69	60
9 to 12	63	52½	7 and 8	63	53
			9 to 12	58	47

Butt Weld, double extra strong, plain ends.

¼	63	56½	¼	57	49
¾ to 1½	66	59½	¾ to 1½	60	52
2 to 2½	68	61½	2 and 2½	62	54

Lap Weld, double extra strong, plain ends.

2	64	57½	2	55	49
2½ to 4	66	59½	2½ to 4	60	54
4½ to 6	65	58½	4½ to 6	59	53
7 to 8.....	58	47½	7 to 8	52	42

To the large jobbing trade an additional 5 and 2½ per cent. is allowed over the above discounts.

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

Boiler Tubes.—Discounts to jobbers, in carloads on lap-welded steel, in effect from May 29, 1913, and standard charcoal-iron boiler tubes, in effect from January 1, 1913, are as follows:

Lap-Welded Steel.		*Standard Charcoal Iron.*	
1¼ and 2 in.....	60	1½ in.	44
2¼ in.	57	1¾ and 2 in.....	48
2½ and 2¾ in.....	63	2¼ in.	44
3 and 3¼ in.....	67	2½ and 2¾ in.....	53
3½ to 4½ in.....	69	3 and 3¼ in.....	55
5 and 6 in.....	63	3½ to 4½ in.....	58
7 to 13	60		

Locomotive and steamship special grades bring higher prices.

2½ in. and smaller, over 18 ft., 10 per cent. net extra.

2¾ in. and larger, over 22 ft., 10 per cent. net extra.

Less than carloads will be sold at the delivered discounts for carloads, lowered by two points for lengths 22 ft. and under to destinations east of the Mississippi River; lengths over 22 ft., and all shipments going west of the Mississippi River must be sold f.o.b. mill at Pittsburgh basing discount, lowered by two points.

Sheets.—Makers' prices for mill shipment on sheets of U. S. Standard gauge, in carload and larger lots, on which jobbers charge the usual advance for small lots from store, are as follows, f.o.b. Pittsburgh, terms 30 days net or 2 per cent. cash discount in 10 days from date of invoice:

Blue Annealed Sheets.

	Cents per lb.
Nos. 3 to 8	1.45 to 1.50
Nos. 9 and 10	1.50 to 1.55
Nos. 11 and 12	1.55 to 1.65
Nos. 13 and 14	1.60 to 1.70
Nos. 15 and 16	1.70 to 1.75

Box Annealed Sheets, Cold Rolled.

Nos. 10 and 11	1.55 to 1.60
No. 12	1.55 to 1.60
Nos. 13 and 14.....	1.60 to 1.65
Nos. 15 and 16	1.65 to 1.70
Nos. 17 to 21	1.70 to 1.75
Nos. 22 and 24.....	1.75 to 1.80
Nos. 25 and 26	1.80 to 1.85
No. 27	1.85 to 1.90
No. 28	1.90 to 1.95
No. 29	1.95 to 2.00
No. 30	2.05 to 2.10

Galvanized Sheets of Black Sheet Gauge.

Nos. 10 and 11	1.90 to 1.95
No. 12	2.00 to 2.05
Nos. 13 and 14.....	2.00 to 2.05
Nos. 15 and 16	2.15 to 2.20
Nos. 17 to 21	2.30 to 2.35
Nos. 22 and 24	2.45 to 2.50
Nos. 25 and 26	2.60 to 2.65
No. 27	2.75 to 2.80
No. 28	2.90 to 2.95
No. 29	3.05 to 3.10
No. 30	3.20 to 3.25

Pittsburgh

PITTSBURGH, PA., December 10, 1913.

Several large steel companies state that in the past week they have noticed an increase in inquiry. Large buyers have been in this city sounding producers as to whether they would sell heavy tonnages in some lines of finished material for delivery through first quarter and first half of 1914 on the basis of 1.15c. to 1.20c. for steel bars and plates and 1.20c. to 1.25c. on structural steel. The mills claim they are not willing to load up so far ahead at these low prices, and the view is taken that there is not going to be a repetition of what occurred early in 1911, when the large steel companies sold for all of that year and into 1912 at extremely low prices. The fact that declines in the market in the past two weeks have not been very marked is regarded in some quarters as indicating that prices are getting close to bottom. Steel bars seem to have settled to 1.20c. on current orders with a possibility that 1.15c. could be done on very attractive tonnage for reasonably prompt shipment. Sheared plates are held at about 1.20c., but in a few cases this has been shaded $1 a ton. Some sheet makers have refused to accept business at current prices for first half delivery. Some rail business for 1914 has been placed, and more is expected to be given out this month. In crude materials, such as pig iron, coke and scrap, the market is dull, with prices ruling steady, largely because not enough new business is coming out to test the market. It is estimated that the production of steel, based on ingot production, is down to about 60 per cent. of the capacity of works, but some steel concerns are operating to only 50 per cent. or less. The Clinton Iron & Steel Company's furnace blew in on Thursday, December 4, on foundry iron. The situation as compared with a week ago is no worse, and there is the encouraging feature that consumers are taking more interest in the market.

Pig Iron.—The low prices ruling on basic iron are interesting consumers. Inquiries are out from three or four of the smaller steel concerns for 8000 to 10,000 tons, deliveries running through first quarter. The asking price on basic by active sellers is $12.75, Valley furnace, but for prompt delivery this might be shaded 10c. to 15c. No sales of Bessemer have been made for some time; the market is nominally $15, Valley furnace, but this would perhaps be shaded 25c. or 50c. on actual business. Small lots of foundry are being sold for prompt delivery. A sale of 500 tons of gray forge is reported for December shipment at $13, Valley furnace. We quote: Bessemer, nominally, $15; basic, $12.75; No. 2 foundry, $13.50; malleable Bessemer, $13.50; gray forge, $13, all at Valley furnace. The freight rate for delivery in the Pittsburgh or Cleveland district is 90c. a ton from Valley furnaces.

Billets and Sheet Bars.—Consumers of steel are reported as intimating that they would be willing to cover their requirements for first half on the basis of $20 for 4 x 4-in. Bessemer or open-hearth billets, and $21 for Bessemer or open-hearth sheet bars. However, the mills do not look favorably on such contracts, knowing that, unless the market improves, the buyers would probably not take the steel, except at prices adjusted to the market in case it should go lower. There is a heavy inquiry for forging billets, and considerable new business has been placed for delivery within the next 90 days at about $24, maker's mill. On axle billets there is a fair inquiry. We quote Bessemer and open-hearth 4 x 4-in. billets at $20 and Bessemer or open-hearth sheet bars at $21, Pittsburgh or Youngstown mills; forging billets, $24, and axle billets about $23, f.o.b. maker's mill, Pittsburgh.

Muck Bar.—The new demand is dull and the supply larger. We quote best grades, made from all pig iron, at $29 to $30, Pittsburgh. Eastern bar is being offered in this market at lower prices.

Steel Rails.—Several of the leading Eastern railroads are stated to have placed their requirements of rails for 1914, but the distribution has not yet been given out here. The Pennsylvania Railroad is not among them, but is expected to buy soon. The demand for light rails has fallen off to some extent, largely due to the slowing down in the coal business. The rerolling rail mills are after new business in light rails keenly and are naming prices about $3 a ton lower than are made on rails rolled from billets. We quote splice bars at 1.50c. and standard section rails at 1.25c. Light rails, rolled from billets, are quoted as follows: 25, 30, 35, 40 and 45 lb. sections, 1.25c.; 16 and 20 lb., 1.30c.; 12 and 14 lb., 1.35c., and 8 and 10 lb., 1.40c., all in carload lots, f.o.b. Pittsburgh.

Plates.—Inquiry for steel cars is light, and only an occasional order is given out. The Standard Steel Car Company has taken 1000 steel hopper cars and some passenger cars for the Lehigh Valley, and the Pressed Steel Car Company has taken 500 steel hopper cars for the Lehigh & New England and 30 narrow-gauge hopper cars for the East Broad Top. The only active inquiry out in this district is that of the Wabash-Pittsburgh Terminal for 1000 steel hoppers and 1000 steel gondolas. No large jobs are in sight involving heavy tonnages of plates, and all the mills are in need of business. We quote ¼-in. plates at 1.20c. for desirable orders and 1.25c. in small lots. On a very attractive specification it is probable that the lower price above named would be shaded about $1 a ton.

Wire Rods.—Only an occasional small lot is sold for prompt shipment, and specifications against contracts are dull. We quote Bessemer, open-hearth and chain rods at $25 to $25.50, prices depending on the order and the deliveries wanted.

Structural Material.—No important contracts were placed in this district the past week, and no large jobs are in sight. One local fabricating concern reports that October and November, in point of business booked, were the two dullest months in its history. We quote beams and channels up to 15 in. at 1.25c. for current business, but a very desirable specification might be placed at a slightly lower price.

Ferroalloys.—Last week's reduction in the price of English ferromanganese has not stimulated the demand in the slightest. Consumers are well covered for two or three months, and are not inclined to buy now for forward delivery. We quote 80 per cent. English ferromanganese at $47, and German, which runs a little higher in phosphorus, at $46.50, Baltimore, the freight rate to Pittsburgh being $2.16 per ton. Prices on ferrosilicon are strong, it being well under control. Carload lots are being sold at the full price for prompt delivery. We quote 50 per cent. ferrosilicon, in lots up to 100 tons, at $75; over 100 tons to 600 tons, $74; over 600 tons, $73, Pittsburgh. We quote 10 per cent. ferrosilicon at $21; 11 per cent., $22, and 12 per cent., $23, f.o.b. cars Jackson County, Ohio, or Ashland, Ky., furnaces. We quote 20 per cent. spiegeleisen at $25 at furnace. We quote ferrotitanium at 8c. per lb. in carloads; 10c. in 2000-lb. lots and over, and 12½c. in less than 2000-lb. lots.

Skelp.—While there is not much new demand, the skelp mills are pretty well filled on old orders for several months. A sale is reported of 1000 to 1200 tons of grooved steel skelp in narrow sizes on the basis of 1.20c., maker's mill. We quote grooved steel skelp at 1.20c. to 1.25c.; sheared steel skelp, 1.30c. to 1.35c.; grooved iron skelp, 1.55c. to 1.60c.; and sheared iron skelp at 1.60c. to 1.65c., Pittsburgh.

Iron and Steel Bars.—Some large consumers of steel bars have been in this city in the past few days inquiring carefully into the situation and to find out what they could do on contracts for first half delivery, but no large business has been closed. Specifications against contracts are fair. The steel bar mills are fast cleaning up contracts. The demand for iron bars is quiet; as a rule, the bar-iron mills are not running to over 50 per cent. of capacity. We quote steel bars at 1.20c. to 1.25c. and common iron bars at 1.35c. to 1.40c. f.o.b., mill, Pittsburgh.

Sheets.—The volume of new inquiry for black and galvanized sheets is better than for some time, and more new orders are being placed, but these are mostly for small lots to cover current needs. Some large consumers of sheets are reported as being disposed to place contracts for first half of 1914 on the basis of 1.90c. for 28 black and 2.90c. for 28 galvanized, but the mills that were offered this business state they turned it down, and are holding 28 black sheets at 2c. and 28 galvanized at 3c., for first quarter delivery and will not sell beyond that period. Most of the sheet mills are operating three to four days per week, and output is not running over 50 to 60 per cent. of capacity. We quote Nos. 9 and 10 blue annealed sheets at 1.50c.; No. 28 Bessemer black, 1.90c. to 1.95c.; No. 28 galvanized, 2.90c. to 2.95c.; No. 28 tin mill black plate, H. R. and A., 1.90c., and Nos. 29 and 30 1.95c. for December shipment while for first quarter of 1914 the mills are holding No. 28 black sheets at 2c. and No. 28 galvanized at 3c. at maker's mill. These prices are f.o.b. Pittsburgh in carload and larger lots, jobbers charging the usual advances for small lots from store.

Tin Plate.—The large tin-plate business from the meat packers and can makers for 1914 is now pretty well under contract, but it is stated that some of this

business was taken at prices that were unsatisfactory to the seller. It is said that the ordinary contracts were taken on the basis of $3.40 for 100-lb. cokes, but the very large trade was allowed the usual differentials if this year were heavier than usual. We quote 100-lb. cokes for ordinary orders at $3.40 and 100-lb. ternes at $3.30 per base box f.o.b., Pittsburgh. On attractive business these prices would be shaded.

Spikes.—There is more new inquiry in the market now for railroad spikes than for some months. The Chicago Great Western and other leading western lines have good-sized inquiries out and two of the leading Eastern roads are expected to come in the market within a very short time for large quantities of spikes for first quarter and first half delivery. The fact that several of the leading Eastern roads have covered their 1914 requirements of rails is taken to indicate they will soon be in the market for the spikes. We quote railroad spikes in base sizes, 5½ x 9/16 in., at $1.50, and small railroad and boat spikes at $1.55 to $1.60 per 100 lb. f.o.b., Pittsburgh.

Bolts and Rivets.—The volume of new orders for nuts and bolts is a little heavier, but they are still confined to small lots to cover actual needs, consumers not being disposed as yet to contract ahead. There is a fair demand for rivets, but mostly in small lots to cover current needs. We quote button-head structural rivets at $1.75 to $1.80, and cone-head boiler rivets at $1.85 to $1.90, in large lots, an advance of about $2 a ton over these prices being charged for small lots. Terms 30 days net, less 2 per cent. for cash in 10 days. The discounts on nuts and bolts are as follows: In lots of 300 lb. or over, delivered within a 20c. freight radius of makers' works:

Coach and lag screws	80 and 20% off
Small carriage bolts, cut threads	75 and 17½% off
Small carriage bolts, rolled threads	80 and 2½% off
Large carriage bolts	70 and 15% off
Small machine bolts, cut threads	80 and 2½% off
Small machine bolts, rolled threads	80 and 7½% off
Large machine bolts	75 and 10 and 2½% off
Machine bolts, with C.P.C. and T nuts, small,	70 and 12½% off
Machine bolts, with C.P.C. and T nuts, large,	70 and 12½% off
Square hot pressed nuts, blanked and tapped	$6.00 off list
Hexagon nuts	$6.70 off list
C.P.C. and R square nuts, tapped and blanked	$5.80 off list
Hexagon nuts, ⅝ and larger	$6.80 off list
Hexagon nuts, smaller than 9/16	$7.40 off list
C.P. plain square nuts	$5.30 off list
C.P. plain hexagon nuts	$5.70 off list
Semi-finished hexagon nuts, ¾ and larger	85 and 10% off
Semi-finished hex. nuts, smaller than 9/16	85, 10 and 5% off
Rivets, 7/16 x 6½, smaller and shorter	80 and 10% off
Rivets, metallic tinned, bulk	80 and 10% off
Rivets, tin plated, bulk	80 and 10% off
Rivets, metallic tinned, packages	80 and 10% off
Standard cap screws	75, 10, 10 and 7½% off
Standard set screws	75, 10, 10 and 7½% off

Shafting.—New demand is quiet and only for small lots to cover current needs. Specifications from the large consumers, notably the automobile builders, are unsatisfactory. Most of the shafting makers have large stocks on hand, made from steel bars at prices considerably higher than are ruling now. We quote cold rolled shafting at 63 per cent. off in carloads and larger lots, but on desirable business, one or two points better would be named. Small lots are held at about 60 per cent. off, delivered in base territory.

Hoops and Bands.—There is a fair amount of new inquiry for hoops for forward delivery, and a moderate business is being placed. The new demand for bands is quiet, and prices are weak. We quote steel bands at 1.20c. to 1.25c., with extras as per the steel bar card, and steel hoops at 1.40c. to 1.45c., maker's mills.

Wire Products.—The buying season in wire products is about over and new business being placed is light and only for small lots. Specifications against contracts are only fair, and none of the wire mills has enough business to run full. We quote wire nails to jobbers at $1.55; cut nails, $1.55; plain annealed wire, $1.35; galvanized barb wire and fence staples, $1.95, and painted barb wire, $1.55, f.o.b. Pittsburgh, per 100 lb., usual terms, actual freight added to point of delivery. We quote woven wire fencing at 74½ per cent. off in carload lots; 73½ per cent. off on 1000-rod lots, and 72½ per cent. on less than 1000-rod lots, all f.o.b. Pittsburgh.

Merchant Steel.—New demand is dull and only for small lots to cover current needs. The mills have pretty well cleaned up old contracts and have only a small amount of business on their books. Prices are weak and are being shaded on desirable orders. We quote nominally as follows: Iron finished tire, 1½ x ¼ in., and larger, 1.35c.; base; under 1½ x ¼ in., 1.50c.; planished tire, 1.55c.; channel tire, ¾ to ⅞ and 1 in., 1.85c. to 1.95c.; 1⅛ in. and larger, 1.95c.; toe calk, 1.95c. to 2.05c., base; flat sleigh shoe, 1.70c.; concave and convex, 1.75c.; cutter shoe, tapered or bent, 2.25c. to 2.35c.; spring steel, 1.95c. to 2.05c.; machinery steel, smooth finish, 1.80c. We quote cold-rolled strip steel as follows: Base rates for 1 in. and 1½ in. and wider, under 0.20 carbon, and No. 10 and heavier, hard temper, 3.25c.; soft, 3.50c.; coils, hard, 3.15c.; soft, 3.40c.; freight allowed. The usual differentials apply for lighter sizes.

Standard Pipe.—Several natural gas and oil companies in the West and South have recently placed a fair sized tonnage of line pipe for prompt shipment, and two or three fair sized inquiries are out. The Texas Company recently placed a contract for considerable line pipe with Youngstown mills and is in the market for about 3000 tons of line pipe and well goods for stock at various points in the South and West. The new demand for lap and butt weld pipe is fair but will probably show a falling off, as considerable outside work is likely to stop most any time. It is stated that discounts on both iron and steel pipe are being firmly held.

Boiler Tubes.—New business is only fair, and is confined mostly to small lots. Competition among the tube mills is keen, and discounts are more or less shaded.

Iron and Steel Scrap.—Little is doing in scrap, as consumers will not take in any more material in December than is absolutely necessary. A large consumer of scrap east of this city, credited with having bought 80,000 to 100,000 tons in the last two months, is stated to have rejected considerable of the scrap received as not up to the quality called for in the contracts. Selected heavy steel scrap has declined squarely to $11 delivered to consumers' mills, several sales having been reported at this price. The embargo on scrap to the plant of the Pittsburgh Crucible Steel Company at Midland, Pa., has been lifted. Dealers are quoting about as follows per gross ton for delivery in the Pittsburgh and other districts:

Selected heavy steel scrap, Steubenville, Follansbee, Brackenridge, Sharon, Monessen, Midland and Pittsburgh delivery	$11.00 to $11.25
Compressed side and end sheet scrap	9.75 to 10.00
No. 1 foundry cast	12.00 to 12.25
No. 2 foundry cast	10.75 to 11.00
Bundled sheet scrap, f.o.b. consumers' mills, Pittsburgh district	6.50 to 6.75
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	13.50 to 13.75
No. 1 railroad malleable stock	11.25 to 11.50
Grate bars	7.50 to 7.75
Low phosphorus melting stock	14.00 to 14.25
Iron car axles	24.25 to 24.75
Steel car axles	17.25 to 17.50
Locomotive axles, steel	20.75 to 21.25
Locomotive axles, iron	25.25 to 25.75
No. 1 busheling scrap	11.25
No. 2 busheling scrap	7.00
*Machine shop turnings	6.50 to 6.75
Old carwheels	13.00 to 13.25
*Cast-iron borings	7.25 to 7.50
†Sheet bar crop ends	13.50 to 13.75
Old iron rails	14.25 to 14.50
No. 1 railroad wrought scrap	13.50 to 13.75
Heavy steel axle turnings	8.75 to 9.00
Stove plate	7.50 to 7.75

*These prices are f.o.b. cars at consumers' mills in the Pittsburgh district.
†Shipping point.

Coke.—Contracts for furnace coke for first half of 1914 delivery, under negotiation for some time, are very slow in being closed up. The reason is that coke makers are not disposed to accept the prices offered by the furnace operators. It is stated one contract for 5000 tons per month for first half has been closed at $1.75 per net ton at oven, and this is believed to be the price which the best grades of furnace coke will eventually reach on contracts. Some makers are still holding their coke for $2 a ton, but it is believed this price cannot be obtained when the low prices ruling for pig iron are considered. We quote strictly standard blast-furnace coke for prompt shipment at $1.75 to $1.80, and for first half of 1914 delivery at $1.80 to $1.85 per net ton at oven. Best grades of 72-hr. foundry coke are held at $2.50 to $2.60 per net ton at oven to consumers. The Connellsville, Pa., Courier reports the output of coke last week in the Upper and Lower Connellsville regions as 344,108 tons, a decrease over the previous week of about 11,000 tons.

The Hibernia iron mines at Hibernia, N. J., belonging to the Wharton Steel Company, are now in complete idleness, the force of men for some time engaged in pumping water having been discharged. No ore had been mined for some time. Formerly this property furnished most of the ore used by the blast furnaces of the Wharton Steel Company. After these were blown out it was sold in the Eastern market.

Chicago

CHICAGO, ILL., December 10, 1913. (*By Telegraph*).

The major portion by considerable of the orders now being placed, whether for pig iron, steel rails or finished products in other form, call for the promptest delivery possible. The aggregate tonnage thus urgently required, even though much below normal, is a reminder that the business of the country has not dried up at the source. New business appears to be near low ebb. The pig-iron market has thus far been disappointing, but with the exception of the drastic cut recently made to secure a tonnage of basic, prices have shown little additional weakness. For heavy steel products the range of prices is now almost entirely between 1.38c. and 1.43c., Chicago, structural shapes continuing to command $1 a ton over plates and bars. In track materials an inquiry for 30,000 kegs of spikes and some small orders for rails are of interest. Bar iron is now quoted generally at 1.15c. Mill activity in this district is declining, the hard steel bar manufacturers in particular having felt the lack of business. The number of unemployed grows steadily and the extent of idleness in the larger mill centers has hardly been exaggerated.

Pig Iron.—The attitude of pig-iron consumers continues to indicate marked uncertainty and lack of information regarding tonnage requirements for next year. Where contract inquiry has appeared, it has been very indefinite, and the only inquiry from which there is a reasonable expectation of business to follow is for small lots for immediate shipment. Except for the price made in connection with the sales of basic to the Commonwealth Steel Company and the Grand Crossing Tack Company, at which time $13.50 at Chicago furnace was shaded, quotations for local iron have not been sufficiently tested to establish the real resistance of the market. The same is true of Southern iron, and no change in the prevailing price of $11, Birmingham, is noted for standard No. 2 iron on direct shipment from furnace. The following quotations are for iron delivered at consumers' yards, except those for Northern foundry, malleable Bessemer and basic iron, which are f.o.b. furnace and do not include a local switching charge averaging 50c. a ton:

Lake Superior charcoal, Nos. 1, 2, 3, 4	$15.25 to $15.75
Northern coke foundry, No. 1	15.00 to 15.50
Northern coke foundry, No. 2	14.75 to 15.00
Northern coke foundry, No. 3	14.25 to 14.75
Southern coke, No. 1 foundry and No. 1 soft	15.60 to 16.15
Southern coke, No. 2 foundry and No. 2 soft	15.10 to 15.60
Southern coke, No. 3	14.60 to 15.10
Southern coke, No. 4	14.10 to 14.60
Southern gray forge	14.10 to 14.60
Southern mottled	13.60 to 14.10
Malleable Bessemer	14.75 to 15.00
Standard Bessemer	17.65
Basic	13.50 to 14.00
Jackson Co. and Kentucky silvery, 6 per cent	18.40
Jackson Co. and Kentucky silvery, 8 per cent	19.40
Jackson Co. and Kentucky silvery, 10 per cent	20.40

(*By Mail*)

Rails and Track Supplies.—The lower prices now being quoted for track fastenings have not been without effect upon the railroads and some inquiry of importance is noted. One road is asking prices on 30,000 kegs of spikes. Rail orders are limited to small tonnages for immediate shipment and include 1200 tons of Bessemer rails for the Chicago & Western Indiana Railway, complete with angle bars, spikes and bolts. Light rail tonnage, though ordinarily of minor importance, has been more consistently sustained during the depression than any other class of material. In the past week an order for 400 tons was received from a Western copper company. Quotations have weakened and we have revised them, now quoting standard railroad spikes at 1.60c. to 1.70c., base; track bolts with square nuts, 2.05c. to 2.10c., base, all in carload lots, Chicago; tie plates, $27 to $28 net ton; standard section Bessemer rails, Chicago, 1.25c., base; open hearth, 1.34c.; light rails, 25 to 45 lb., 1.25c.; 16 to 20 lb., 1.30c.; 12 lb., 1.35c.; 8 lb., 1.40c.; angle bars, 1.50c., Chicago.

Structural Material.—The past week has been decidedly uneventful in connection with structural shapes, the only award of importance in fabricated steel being 1000 tons for the power house of the American Power & Light Company, Waco, Texas. This was taken by the Virginia Bridge & Iron Company. Mill tonnage was exceedingly limited and prices have settled very generally to the basis of 1.43c., Chicago. We quote for Chicago delivery from mill 1.43c.

The market for structural steel out of store is without feature and we continue to quote 1.85c. Chicago.

Plates.—With the exception of a few mills, which for technical reasons are not especially eager for business and are accordingly holding their price on the basis of 1.25c., Pittsburgh, quotations made with the hope of securing business have dropped very generally to 1.38c., Chicago. There is very little inquiry and the business placed warrants no special mention. For Chicago delivery from mill we quote 1.38c. to 1.43c.

We quote for Chicago delivery from jobbers' stocks 1.85c.

Sheets.—With better prices prevailing, the aggregate of sheets placed from day to day with the mills would be far from unsatisfactory. The business coming out is viewed with additional satisfaction because it is for immediate shipment and indicates not only a sustained consumption but the almost complete depletion of stocks. We quote for Chicago delivery from mill: No. 10 blue annealed, 1.68c. to 1.73c.; No. 28 black, 2.08c. to 2.13c.; No. 28 galvanized, 3.08c. to 3.13c.

From store for Chicago delivery we quote No. 10 blue annealed, 1.95c. to 2.05c.; No. 28 black, 2.55c. to 2.65c.; No. 28 galvanized, 3.60c. to 3.70c.

Bars.—Prices for both iron and steel bars have settled further and current business is being placed at 1.15c. for iron and 1.38c. for steel. Local bar iron manufacturers are also somewhat on the defensive in maintaining this basis. New business in bars rolled from old steel rails has fallen off to such an extent that the western mills are temporarily at the end of their rolling schedules. The mill at Moline and one at Chicago Heights are down, the Laclede Steel Company is rolling but a few turns each week and the Calumet Steel Company is likely to be down at least a part of this week. We quote for mill shipment as follows: Bar iron, 1.15c.; soft steel bars, 1.38c.; hard steel bars, 1.35c. to 1.40c.; shafting in carloads, 60 to 65 per cent. off; less than carloads, 55 to 60 per cent. off.

Store prices for iron and steel bars for Chicago delivery are: Soft steel bars, 1.75c.; bar iron, 1.75c.; reinforcing bars, 1.75c. base, with 5c. extra for twisting in sizes ½ in. and over, and usual card extras for smaller sizes; shafting 55 to 57 per cent. off.

Rivets and Bolts.—Market conditions are unchanged with demand limited. We quote from mill as follows: Carriage bolts up to ⅜ x 6 in., rolled thread, 80-2½; cut thread, 75-17½; larger sizes, 70-15; machine bolts up to ⅜ x 4 in., rolled thread, 80-7½; cut thread, 80-2½; large size, 75-2½; coach screws, 80-10-10; hot pressed nuts, square head, $6 off per cwt.; hexagon, $6.70 off per cwt. Structural rivets, ½ to 1¼ in., 1.88c., base, Chicago, in carload lots; boiler rivets, 10c. additional.

Out of store we quote for structural rivets, 2.40c., and for boiler rivets, 2.60c. Machine bolts up to ⅜ x 4 in., 70-5-10; larger sizes, 70-7½; carriage bolts up to ⅜ x 6 in., 75-5; larger sizes, 70-7½ off. Hot pressed nuts, square head, $5.50, and hexagon, $6.20 off per cwt.

Cast Iron Pipe.—The United States Cast Iron Pipe & Foundry Company was the successful bidder for an aggregate of 1050 tons of pipe mentioned last week as pending at Mt. Ayr, Iowa, and Olathe, Kan. This was practically the only business of the week. We quote as follows, per net ton, Chicago: Water pipe, 4 in., $27; 6 to 12 in., $25; 16 in. and up, $24, with $1 extra for gas pipe.

Wire Products.—While tonnage reports are no more favorable there seems to be less pressure upon prices than is noted from other districts, and the Pittsburgh basis of 1.55c. for wire nails obtains for the limited business reported. We quote to jobbers as follows: Plain wire, No. 9 and coarser, base, $1.53 to $1.58; wire nails, $1.73 to $1.78; painted barb wire, $1.73 to $1.78; galvanized, $2.10 to $2.15; polished staples, $1.73 to $1.78; galvanized, $2.05 to $2.10, all Chicago.

Old Material.—With consumers' yards well filled with scrap gradually acquired at the tempting prices that have prevailed, and with dealers loaded in most instances with as large a tonnage as they can carry, the only promise of better values seems to lie in a marked improvement of business in new materials. The past week brought out still lower prices for most grades, a decline which can hardly be checked as long as the manufacturers and railroads continue in the policy of moving their accumulations at the best price obtainable. The interesting feature of the railroad offerings of the past week was the 1100 tons of old iron rails included in the lists sent out by the Great Northern Railway and the Chicago, Milwaukee & St. Paul. The former list totaled 3500 and the latter 2750 tons. The Wabash Railroad also asked prices on a round tonnage. We quote for delivery at buyers'

works, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton.

Old iron rails	$13.00 to $13.50
Old steel rails, rerolling	11.25 to 11.75
Old steel rails, less than 3 ft.	10.25 to 10.75
Relaying rails, standard section, subject to inspection	24.00
Old carwheels	12.00
Heavy melting steel scrap	9.00 to 9.50
Frogs, switches and guards, cut apart	9.00 to 9.50
Shoveling steel	8.50 to 9.00
Steel axle turnings	6.50 to 7.00

Per Net Ton.

Iron angles and splice bars	$11.75 to $12.25
Iron arch bars and transoms	12.00 to 12.50
Steel angle bars	8.00 to 8.50
Iron car axles	17.25 to 17.75
Steel car axles	12.00 to 12.50
No. 1 railroad wrought	8.50 to 8.75
No. 2 railroad wrought	7.75 to 8.00
Cut forge	8.00 to 8.25
Steel knuckles and couplers	8.75 to 9.25
Steel springs	9.25 to 9.75
Locomotive tires, smooth	10.25 to 10.75
Machine shop turnings	4.25 to 4.50
Cast borings	4.00 to 4.25
No. 1 busheling	7.25 to 7.75
No. 2 busheling	5.75 to 6.00
No. 1 boilers, cut to sheets and rings	5.75 to 6.00
Boilers punchings	9.75 to 10.25
No. 1 cast scrap	9.75 to 10.25
Stove plate and light cast scrap	9.25 to 9.75
Grate bars	8.25 to 8.75
Railroad malleable	9.00 to 9.25
Agricultural malleable	8.00 to 8.50
Pipes and flues	6.50 to 7.00

Philadelphia

PHILADELPHIA, PA., December 9, 1913.

A slightly better run of new business has enabled a few finishing mills to continue operations at an unchanged basis, but with the majority there is an accumulation of stocks. Some makers of steel products are endeavoring to keep in partial operation until December 20, when plants will be shut down for the holidays, resumption being dependent on the condition of order books. The stand taken by some producers regarding the price situation has stiffened the tone of the market, the 1.35c. delivered basis for plates, shapes and steel bars being pretty well maintained at this time. Immediate business in steel billets has been very small. The pig-iron markets drag. Foundry iron is easier, without any important sales. There has been no demand for steel making grades. Coke prices are easier, with buying light. The old material market is practically at a standstill.

Iron Ore.—Consumers are disinterested. Supplies are greater than furnaces can care for, and efforts to have deliveries deferred are numerous. Importations at this port in the week ended December 6 included 2500 tons from Venezuela and 4700 tons from Cuba. Recent importations at Chester, Pa., included 10,400 tons from Cuba and 9564 tons from Spain.

Pig Iron.—While some consumers are showing a trifle more interest, the situation does not gain in strength. Foundry grades have been sold for early delivery at a concession of 25c. a ton, but makers are not forcing business although competing sharply on what few inquiries come out. The most important inquiry for some time is that of the Pennsylvania Railroad, for a minimum of 2650 tons of coke foundry and 600 tons of charcoal iron, with a maximum of 5300 tons of the former and 1200 tons of the latter, for delivery in the first quarter, at its Altoona shops. A Virginia railroad is also in the market for upward of 1000 tons of mixed grades, for first quarter. The majority of pig-iron sales have been in small lots, although in one or two instances sales of 500 tons for first quarter have been made. These are understood to have been Buffalo irons, at $15.45 delivered for No. 2 X. Standard brands of eastern Pennsylvania No. 2 X foundry are being sold in small lots for early shipment, at prices ranging from $15.25 to $15.50 delivered, with an occasional odd car at somewhat higher figures. At the same time less desirable brands are available at $15 delivered; while reports of even lower prices have been heard, they are not substantiated for standard analysis iron. Cast-iron pipe makers have been taking odd lots of low grade iron at $14.50 to $14.75 delivered, but closing on one of the recent large inquiries in this district is understood to have been deferred. Virginia foundry iron has been quiet, with some indication of weakness. Recent sales have been at $13, Virginia furnace, for No. 2 X. Small sales of low grade Virginia foundry are reported at $12.50 furnace. Rolling mill forge iron has been uncalled for. Steel making grades are in light demand. Basic has been uncalled for; while nominally quoted at $15 delivered, this would no doubt be shaded on a good quantity. Standard low phosphorus is still quoted at $22 delivered in this territory. No further sales of foreign low phosphorus have been reported. In competition with domestic low phosphorus recently, foreign iron was offered at $21 delivered in this district, but the business went to a domestic maker at an even price, even at a higher phosphorus content. Producers of pig iron are feeling more keenly the falling off in new business. Stocks on hand are inclined to move upward. Several producers in the East are contemplating blowing out their furnaces unless business becomes more active, as they are disinclined to pile iron. Consumers are deferring deliveries more freely, both in foundry and steel making grades. The following range of prices applies on small lots of standard brands, delivered in buyers' yards in this district:

Eastern Pennsylvania No. 2 X foundry	$15.25 to $15.50
Eastern Pennsylvania No. 2 plain	15.00 to 15.25
Virginia No. 2 X foundry	15.80 to 16.00
Virginia No. 2 plain	15.55 to 15.75
Gray forge	14.50 to 14.75
Basic (nominal)	15.00
Standard analysis low phosphorus	22.00

Ferroalloys.—Small lots of 80 per cent. ferromanganese continue to be sold for early delivery, but buyers are showing no interest in forward requirements. Standard English ferromanganese for either prompt or forward delivery is quoted at $47, seaboard. Importations of ferromanganese at this port last week aggregated 1036 tons. There has been little demand for ferrosilicon.

Billets.—Some sounding of the market for rolling billets, in lots of several thousand tons, for delivery early next year, has been made by consumers, but producers are not anxious to take forward business at prices now ruling. New orders have been light and specifications meager, so that mills, even though operating at about 30 per cent. capacity, are steadily accumulating stock. While the leading producer hopes to keep its plant going until December 20, there is a strong probability of its being temporarily closed at the end of this week. Prices are largely nominal, basic open-hearth rolling billets being quoted at $22.40 delivered in this district, while ordinary forging steel commands from $26.40 to $27.40, according to specification.

Plates.—Some mills have received a slightly larger volume of miscellaneous business, but mill activities show little change. Makers have apparently made a stand on prices, which now range from 1.35c. to 1.40c. delivered in this district, dependent on the tonnage taken and the character of specification. Current miscellaneous business, however, still commands 1.40c. to 1.45c. delivered here. Considerable business in ship plates is before the trade and it is reported that the leading interest will supply 3000 to 4000 tons of material for a vessel to be built by one of the Delaware River yards.

Structural Material.—Prices appear to be more firmly maintained, although the volume of new business has not materially increased. Orders for small lots have been less in evidence. Several contracts for fabricated work, involving not over a few hundred tons, in plain shapes, have been closed. On large lots, plain shapes are quoted at 1.35c. here, but on current miscellaneous business 1.40c. to 1.45c. rules.

Sheets.—Most Eastern mills have but a few days rolling ahead and some are operating on stock orders to keep plants running. Orders have been light and mostly for immediate delivery. Few consumers are making inquiries for forward requirements. Prices are irregular, much depending on the nature of the inquiry. For ordinary business 1.60c. to 1.65c. delivered here represents the market for No. 10 blue annealed sheets.

Bars.—Business has been comparatively quiet. Consumers of common iron bars are placing orders for small lots to piece out requirements, while on larger propositions further developments are being awaited. Mill operations are generally smaller. Ordinary iron bars are quoted at 1.25c. to 1.32½c. delivered here, with the better grades commanding up to 1.37½c. Business in steel bars is light, but prices are drawing more in line with other rolled steel products, being quoted at 1.40c. delivered here and on desirable contracts this could probably be shaded.

Coke.—Some inquiry for furnace coke for first half has been before the trade but consumers hold off, anticipating even lower prices. Forward furnace coke is available at $2 to $2.25 at oven, according to grade, while prompt furnace coke is quoted at $1.75 to $1.90. Foundry coke has not been active. This grade is quoted at $2.75 to $3 at oven, although some producers

hold at $3.10. The following range of prices, per net ton, is named for deliveries in buyers' yards in this territory:

Connellsville furnace coke	$3.90 to $4.40
Connellsville foundry coke	4.90 to 5.25
Mountain furnace coke	3.60 to 4.10
Mountain foundry coke	4.60 to 4.95

Old Material.—Business with consumers is practically at a standstill. As the year end approaches, buying usually falls off and about the only movement is that between brokers, applying on unfilled contracts. Mills express a willingness to pay $10 delivered for No. 1 heavy melting steel, but are not anxious to buy, while most sellers refuse to let holdings go at that price. Rolling mills are practically out of the market until after the year end. Turnings and borings are weaker. Quotations are largely nominal and the range of prices in practically all grades is narrower. The following quotations about represent figures at which business could be done, delivered in buyers' yards in this district, covering eastern Pennsylvania and taking freight rates varying from 35c. to $1.35 per gross ton:

No. 1 heavy melting steel	$10.00 to $10.25
Old steel rails, rerolling (nominal)	12.25 to 12.50
Low phosphorus heavy melting steel scrap (nominal)	14.00 to 14.50
Old steel axles (nominal)	15.50 to 16.00
Old iron axles (nominal)	21.00
Old iron rails (nominal)	15.50
Old carwheels	12.00 to 12.50
No. 1 railroad wrought	12.75 to 13.00
Wrought-iron pipe	7.75 to 8.25
No. 1 forge fire	7.50 to 8.00
No. 2 light iron (nominal)	5.00
No. 2 busheling (nominal)	7.50 to 8.00
Wrought turnings	6.75 to 7.00
Cast borings	7.00 to 7.50
Machinery cast	12.00 to 12.50
Grate bars, railroad	9.00 to 9.50
Stove plate	9.50 to 10.00
Railroad malleable (nominal)	9.50 to 10.00

Cleveland

CLEVELAND, OHIO, December 9, 1913.

Iron Ore.—There are large stocks of ore in furnace yards at the close of the lake shipping season and conditions indicate light dock shipments this winter, a large amount of unused ore at the opening of navigation next year and a light buying movement in 1914. While the amount on docks December 1 was less than on the corresponding date a year ago, this is due to the fact that furnaces are enlarging their storage yard capacities and are taking more direct shipments every year. A reduction in prices next year is considered certain, but it will probably be some time before the question of prices is given consideration by ore firms. We quote 1913 prices as follows: Old range Bessemer, $4.40; Mesaba Bessemer, $4.15; old range non-Bessemer, $3.50; Mesaba non-Bessemer, $3.40.

Pig Iron.—There is very little demand and few furnaces care to take on heavy business at present prices. With very little iron sold for delivery after January 1 and most consumers having only enough under contract to last them a few weeks at the first of the year, some orders of size are sure to be booked early in January and sellers are wondering whether foundrymen will cover their first quarter or half or buy only spot iron. Whether some furnaces will continue in operation without orders on books will depend on the demand that develops next month and on the price situation. Sellers find some satisfaction in the number of stacks already out, the majority of which will not probably be blown in until better prices prevail. At present only one merchant furnace making foundry iron is in operation in the Mahoning Valley. Foundry iron is now being offered by a Cleveland maker at $13.25 at furnace for No. 2 for local delivery, a decline of 25c. from last week. This price is 25c. lower than is quoted by Valley furnaces. There is some inquiry for round lots of Southern iron, but sellers believe that these are not put out with a view of buying, but to keep in touch with the situation. With the disappearance of resale iron Southern iron is firm at $11 for No. 2. A few small lot prompt shipment sales have been made at that price. We quote delivered Cleveland as follows:

Bessemer	$15.90
Basic	13.75
Northern No. 2 foundry	$13.50 to 14.00
Southern No. 2 foundry	15.35
Gray forge	13.00
Jackson County silvery 8 per cent. silicon	18.55

Coke.—The market is quiet and prices are weak. Most of the best makes of foundry coke are being offered at $2.50 to $2.75 per net ton and sellers will make contracts at these prices. Several makers are offering prompt shipment furnace coke at $1.75 per net ton and this price can probably be shaded.

Finished Iron and Steel.—The prevailing low prices have resulted in some inquiry for steel bar contracts for the first quarter and first half delivery, the most of these coming from the bolt, nut and rivet manufacturers. Steel bars have declined $1 a ton to 1.20c., Pittsburgh, for early delivery. One mill made this price late last week and several others are meeting the quotation. The market is weak and a round lot inquiry would probably bring out a lower price. A leading producer is asking 1.25c. for steel bars for delivery during the first half. Another mill has contracted for some first quarter tonnage at 1.30c., the buyer being permitted to specify at the going market price as long as it is below 1.30c. Plates are quoted at 1.20c., Pittsburgh, and structural material at 1.25c. The contract for the steel for the Missouri State Capitol, 5200 tons, has been awarded by John Gill & Sons, Cleveland, to the Christopher & Simpson Iron Works, St. Louis. The Forest City Steel & Iron Company, Cleveland, has taken 500 tons for the Bourne-Fuller warehouse. Another structural order placed is for 365 tons. An order for 800 tons of structural material, plates and bars for two ore bridges was placed at 1.25c. for one and a lower price for the other, which was an export order. Another local inquiry for rerolling billets has come out, this being for 1000 tons, but this order and another for 5000 tons has not yet been placed. Forging billets are quoted at $23 to $24, Pittsburgh. Bar iron is quoted at 1.25c., Cleveland, but this price can probably be shaded $1 a ton on a desirable order. Local bar mills are running at 50 per cent. capacity. Sheets are in fair demand and minimum prices of 1.90c. at mill for No. 28 black and 2.90c. for No. 28 galvanized appear to be well maintained. Warehouse prices are unchanged at 1.90c. for steel bars and 2c. for plates and structural material.

Old Material.—There is some demand for small lots for immediate delivery and consumers generally are taking shipments of material under contract. Prices show no tendency to go below the low level at which they have stood for the past few weeks. Busheling is slightly more active, there being a fair volume of trading in this grade between dealers, some of whom appear to have sold short. As a result busheling is a trifle firmer and dealers are trying to get 25c. a ton above recent quotation for this material. Some offers of $8.25 for No. 1 busheling have been declined. One mill is in the market for heavy melting steel scrap at $9.50 per gross ton. We quote, f.o.b. Cleveland, as follows:

Per Gross Ton.	
Old steel rails, rerolling	$12.00 to $12.50
Old iron rails	12.50 to 13.00
Steel car axles	16.50 to 17.00
Heavy melting steel	9.25 to 9.50
Old carwheels	11.50 to 12.00
Relaying rails, 50 lb. and over	23.00 to 25.00
Agricultural malleable	9.00 to 9.50
Railroad malleable	10.00 to 10.50
Light bundled sheet scrap	6.50 to 7.00
Bundled tin scrap	11.00 to 11.50

Per Net Ton.	
Iron car axles	$18.00 to $19.00
Cast borings	5.50 to 5.75
Iron and steel turnings and drillings	4.25 to 4.50
Steel axle turnings	5.75 to 6.00
No. 1 busheling	8.00 to 8.50
No. 1 railroad wrought	9.50 to 10.00
No. 1 cast	10.50 to 11.00
Stove plate	8.00 to 8.50

Cincinnati

CINCINNATI, OHIO, December 10, 1913.—(*By Telegraph*).

Pig Iron.—Furnaces in the South and in the Hanging Rock district are resisting strongly attempts by buyers to beat down prices, but they have not been uniformly successful. It is reported that the present quotations of $11, Birmingham, and $13.50, Ironton, have been shaded the past week on prompt shipment business, but buying has been so slack that not enough iron has changed hands in this territory to warrant any change in the figures quoted. Practically all inquiries out in the open are for limited tonnages, and the largest general one is for 600 tons of Northern foundry iron for first half shipment from an Indiana melter. However, there is under negotiation, in a quiet way, quite a large tonnage of foundry iron, with no definite requests for bids on the business asked for by the prospective cus-

tomers, except from closely allied interests. As a general rule, buyers are trying to feel out the market and do not feel disposed to obligate themselves. They evidently believe the rumor that a number of furnaces are anxious for business, and are not willing to take any chances on buying, except for immediate requirements. Basic-iron quotations are somewhat uncertain, but it is hardly probable that future contracting can be done below present quotations for No. 2 foundry iron. There is a slightly better demond for the Ohio silvery irons. Malleable is slow, but it is stated that a number of agricultural implement manufacturers in other districts are disposed to contract for their future requirements. Based on freight rates of $3.25 from Birmingham and $1.20 from Ironton we quote, f.o.b. Cincinnati, as follows:

Southern coke, No. 1 foundry and 1 soft	$14.75 to $15.25
Southern coke, No. 2 foundry and 2 soft	14.25 to 14.75
Southern coke, No. 3 foundry	13.75 to 14.25
Southern, No. 4 foundry	13.25 to 13.75
Southern gray forge	12.75 to 13.25
Ohio silvery, 8 per cent. silicon	18.20 to 18.70
Southern Ohio coke, No. 1	15.70 to 16.20
Southern Ohio coke, No. 2	14.70 to 15.20
Southern Ohio coke, No. 3	14.45 to 14.70
Southern Ohio malleable Bessemer	15.20 to 15.45
Basic, Northern	15.20 to 15.45
Lake Superior charcoal	16.25 to 17.25
Standard Southern carwheel	27.25 to 27.75

(By Mail)

Coke.—Several consumers of furnace coke are said to be willing to contract for their future requirements. These reports cannot be substantiated here, and it is generally believed that the furnaces will continue the policy of only buying for nearby needs. Prices on Connellsville furnace and foundry coke are weak, and a few standard brands of 48-hr. have been quietly offered around $1.75 per net ton at oven. The contract price is from $1.80 to $2. Both Wise County and Pocahontas brands are holding up better, although no furnace coke business is reported from those districts. Foundry coke is almost at a standstill, as far as new business is concerned, but there are a number of foundries in this immediate vicinity that will be compelled to cover for future requirements at an early date. Standard foundry Connellsville coke is quoted at $2.50 to $2.85 for either prompt or future shipment. Wise County and Pocahontas 72-hr. coke is held from 10c. to 25c. a ton higher.

Finished Material.—A fairly good demand is noted for both black and galvanized sheets. Considering the nearness of the holiday season and the somewhat unsettled conditions reported from other centers, the local warehouses have no complaints to make, and it is believed that after inventories have been made the year's showing will be better than many anticipate. The local warehouse quotations are as follows: Steel bars, 1.90c.; structural shapes, cut to length, when desired, 2c.; No. 28 black sheets, carload lots, 2.05c. to 2.10c.; galvanized sheets, 3.05c. to 3.10c. Cold weather has curtailed buildings operations, and there is nothing to indicate any early call for structural material.

Old Material.—There is no demand for any kind of scrap, and yard stocks are accumulating. The largest customers at present are the rolling mills, but they have a good supply on hand and are not anxious to make further purchases. The minimum figures given below represent what buyers are willing to pay for delivery in their yards, southern Ohio and Cincinnati, and the maximum quotations are dealers' prices f.o.b. at yards:

Per Gross Ton.

Bundled sheet scrap	$6.25 to $6.75
Old iron rails	10.75 to 11.75
Relaying rails, 50 lb. and up	19.50 to 20.00
Rerolling steel rails	10.75 to 11.25
Melting steel rails	9.00 to 9.50
Old carwheels	10.00 to 10.50

Per Net Ton.

No. 1 railroad wrought	$8.25 to $8.75
Cast borings	4.00 to 4.50
Steel turnings	4.00 to 4.50
No. 1 cast scrap	8.50 to 9.00
Burnt scrap	5.75 to 6.25
Old iron axles	15.75 to 16.25
Locomotive tires (smooth inside)	9.50 to 10.00
Pipes and flues	5.50 to 6.00
Malleable and steel scrap	6.50 to 7.00
Railroad tank and sheet scrap	4.00 to 4.50

Edward S. Stevens has been appointed trustee for the unsecured creditors of the Sandusky Auto Parts & Motor Company, Sandusky, Ohio. This company is in bankruptcy and an attempt will be made to straighten out its financial affairs so that the plant can be again placed in operation.

Boston

BOSTON, MASS., December 9, 1913.

Old Material.—Few sales are recorded. Dealers say it would be difficult to take care of large orders, if such were received, because very little scrap is coming out. Producers are holding on to their stocks and small dealers are doing little collecting because no chance of profit exists under present conditions. Transactions are so few that prices are merely nominal. The quotations given below are based on prices offered by the large dealers to the producers and to the small dealers and collectors, per gross ton, carload lots, f.o.b. Boston and other New England points which take Boston rates from eastern Pennsylvania points. In comparison with Philadelphia prices the differential for freight of $2.30 a ton is included. Mill prices are approximately 50c. a ton more than dealers' prices.

Heavy melting steel	$7.75 to $8.00
Low phosphorus steel	13.75 to 14.75
Old steel axles	13.25 to 13.75
Old iron axles	21.25 to 21.75
Mixed shafting	12.25 to 12.50
No. 1 wrought and soft steel	9.00 to 9.25
Skeleton (bundled)	6.00 to 6.50
Wrought-iron pipe	6.50 to 7.00
Cotton ties (bundled)	7.00 to 7.25
No. 2 light	3.75 to 4.25
Wrought turnings	4.50 to 5.00
Cast borings	4.50 to 5.00
Machinery, cast	11.25 to 11.50
Malleable	8.00 to 8.25
Stove plate	7.75 to 8.00
Grate bars	6.25 to 6.50
Cast-iron carwheels	11.00 to 11.25

Birmingham

BIRMINGHAM, ALA., December 8, 1913.

Pig Iron.—Birmingham district iron makers continue to ask $11, at which a limited amount of iron has been sold. Small lots of special analysis iron have been sold on a basis of $12.50 and of $10.75 for No. 4, but they do not indicate the general market. The leading interest is quoting $11 and nothing under, but it is understood that sales have been light. Confidence in their ability to secure $11 for 1914 iron seems to be more general among furnace operators. Stocks are so low as to be termed "dangerously low." The new wire mill of the American Steel & Wire Company is receiving billets from the Tennessee Company's works at Ensley to try out the machinery prior to commencing regular operations in a few weeks. This plant will require the output of a large blast furnace, taking that much more out of the competitive market. Report has it that the Tennessee Company will blow in Alice on basic again to help take care of this new consumer of steel. It is also understood that the Gulf States Steel Company (Standard) will soon blow in its furnace at Gadsden on basic, making 8 Alabama stacks on basic for home use and 13 on foundry for the general trade. The additional order of 28,000 tons of rails received by the Tennessee Company from the Southern Pacific has further allayed apprehension of a shut down of the Ensley rail mill and the substitution of foundry for basic output on the part of the Tennessee Company. While the Alabama iron output for 1913 will be over 2,000,000 tons and the largest on record, the year will close with the smallest stocks on hand in several years. This short supply, the increase in home consumption and the apparent determination of Southern operators not to sell at a loss are factors to be taken into consideration by consumers when they commence buying for 1914. We quote, per gross ton, f.o.b. Birmingham district furnaces (the high figures representing occasional sales) as follows:

No. 1 foundry and soft	$11.25 to $11.75
No. 2 foundry and soft	11.00 to 11.25
No. 3 foundry	10.75 to 11.00
No. 4 foundry	10.50 to 10.75
Gray forge	10.25 to 10.50
Basic	11.00 to 11.25
Charcoal	23.50 to 24.00

Cast-Iron Pipe.—Water pipe makers are finding it difficult to maintain operations on anything like full time. An order for 500 tons has been the largest received in two weeks. Prices, however, seem to remain steady, and as soon as money is obtainable by communities for water works extensions, etc., the pipe shops expect a good business. Some sales of soil pipe have been made during the week. We quote, per net ton, f.o.b. plants: 4-in., $22; 6-in. and upward, $20, with $1 added for gas pipe.

Coal and Coke.—The smaller coal mines without large contracts are finding it difficult to keep up full operations. Up to the close of last week the New Orleans Street Railway had not given its expected order for 125,000 tons for a year's supply. Coke is in fair demand and prices are ruling about the same as for several weeks. We quote, per net ton, f.o.b. oven, as follows: Furnace coke, $2.50 to $3; foundry, $3.50 to $4.

Old Material.—Dealers report a fair demand for the steel grades of scrap, but otherwise the market is featureless and sales are based on the hand-to-mouth needs of the buyers. We quote, per gross ton, f.o.b. dealers' yards, as follows:

Old iron axles (light)	$15.00 to $15.50
Old steel axles (light)	15.00 to 15.50
Old iron rails	12.50 to 13.50
No. 1 railroad wrought	12.00 to 12.50
No. 2 railroad wrought	10.00 to 10.50
No. 1 country wrought	9.50 to 10.00
No. 2 country wrought	8.50 to 9.00
No. 1 machinery cast	10.00 to 10.50
No. 1 steel scrap	10.50 to 11.00
Tram carwheels	10.50 to 11.00
Standard carwheels	12.00 to 12.50
Light cast and stove plate	8.50 to 9.00

German Reports Are More Cheerful

Bars and Plates Are Higher—Some Bar Makers Sold Up to the End of March

BERLIN, November 27, 1913.

The improvement in the iron trade has made further progress. Bars and plates have risen again this week, and the reports arriving here indicate increased activity in buying these products. This is especially the case with bars, for which foreign markets in particular are showing a heavy demand. From the Lorraine-Luxemburg district, on the other hand, a reduced demand for ores is reported; both German and Belgian consumers are making lighter calls for deliveries. Producers have therefore restricted operations, and a considerable number of miners have crossed the frontier into France to obtain employment.

Advances in Bars and Plates

On the Düsseldorf Exchange last week bars and plates were advanced, to take account of the changes already made by manufacturers. Basic steel bars were quoted at 96 to 99 marks ($22.85 to $23.56), as compared with 95 to 98 marks ($22.61 to $23.32) previously; heavy plates, 102 to 105 marks ($24.28 to $24.99) against 100 to 105 marks ($23.80 to $24.99), and boiler plates, 112 to 115 marks ($26.66 to $27.37) against 110 to 115 marks ($26.18 to $27.37). This week manufacturers have further marked up their prices 3 marks (71c.). Several of the big companies, including Phönix and the Rheinische Stahlwerke, have sold their capacity to the end of March, and are accordingly holding their prices firmly. The latter is demanding 100 marks ($23.80) for steel bars, but the average price in the lower Rhine region is given at 98 to 99 marks ($23.32 to $23.56), with 1½ per cent. discount. For heavy plates 102 marks ($24.28) net is now demanded, and one establishment is mentioned as not selling below 104 marks ($24.72). Several days ago the De Wendel concern at Hayingen, near the French border, raised its price for sheets thinner than 1½ mm. (No. 17) by 5 marks ($1.19) offering as its reason the heavy employment of its mills, which rank second in importance in Lorraine.

The Pig-Iron Situation

The position of pig iron appears to be not a little mixed. At a meeting of the syndicate at the end of last week, a statement was given out representing the October shipments as satisfactory, having reached 92.75 per cent. of allotments. As to sales since business for 1914 delivery was declared open it says that a part of the consumers have covered their requirements, and adds: "The foreign demand for pig iron has become decidedly more active within the past few days—a sign that consumers, after further price reductions in the English market, now consider prices as having reached bottom." On the other hand, trade reports are mentioning the fact that English foundry iron is coming into Germany and competing successfully with the home product, finding its way up the Rhine even as far as the region of Mannheim and Frankfort. The Essen Syndicate, as will be recalled, cut its prices some time ago for regions adjacent to seaports in order to meet English prices; and it is asserted in the trade press that it will very probably now decide to make special prices for points accessible to the Rhine. The market reports too, are more frank in dealing with the trade tendency than the syndicate; they admit that orders are coming in sluggishly, and that there is not only competition with English iron but (in Saxony) with Austrian also.

Very active buying has latterly occurred in sheets. It is rarely possible now to buy under 120 marks ($28.56).

Tube Manufacturers' Meeting

Another meeting of the tube manufacturers was held today, looking toward organizing this trade, but the result is not yet known. It appears now that a syndicate on the broadest scale is contemplated, covering all forms of tubing, and including both home and foreign markets. A report on the matter several days ago represented the outlook as decidedly hopeful; it was said that an agreement had been reached on all points except production quotas. A dispatch of today, however, says that there are great obstacles as to quotas to be overcome. Thyssen especially is represented as making exorbitant demands; and the outcome is looked upon as doubtful. There is a growing scarcity of work on tubing; Phönix and several other large concerns are running only five days each week.

The De Wendel concern already mentioned will erect 50 additional coke ovens at Gross-Moyeuvre and also several blast furnaces. The town mentioned is in close proximity to the frontier and near the Briey basin of France, famous for its recent development as an iron ore region.

Belgian news is again mixed. At the end of last week a Brussels dispatch said that the Steel Association would reduce the home price of semi-finished products 3 francs (58c.) a ton, but this has apparently not yet been done. On the other hand, the home price for iron bars was raised 2 francs (39c.) to 132.50 to 135 francs ($25.57 to $25.77), and bands also 2 francs to 160 to 165 francs ($30.88 to $31.85).

St. Louis

ST. LOUIS, MO., December 8, 1913.

A slightly better feeling prevails, due in part to improvement in inquiry, to a feeling that the bottom has been reached and an impression that there is likely to be better buying from this time on. Prices show no further inclination to recede.

Pig Iron.—No large inquiries or orders have developed, but they seem to satisfy furnace representatives that consumers are approaching the point where they must buy. Included in the sales reported are one of 500 tons approximating in analysis about a No. 1 soft, one of 500 tons of No. 2 Southern, one of 400 tons of No. 2 Northern, one of 250 tons of No. 2 Southern, one of 200 tons of No. 2 Southern, one of 500 tons of No. 2 Northern, one of 200 tons of No. 2 Northern, two of 150 tons each of No. 2 Southern, two of 125 tons of No. 2 Southern, several of 100 tons of No. 2 Southern, together with considerable aggregate in the 50-ton and carload lot class. Inquiries not yet closed include one for 800 tons of No. 2 Southern and one for 500 tons of No. 2 Southern. Representatives are firm in their quotation of $11 for No. 2 Southern foundry, Birmingham basis, and sales sheets show that they are getting the figure. This price is for December and for first quarter. There is no disposition to contract or quote beyond first quarter. Furnace yards are not overstocked, the production having been brought down by the furnaces which have been put out of blast. No. 2 X Chicago is quoted here now at $15, but could probably be obtained at $14.50. No. 2 Northern is quoted at $13.50 Ironton basis.

Coke.—There has been a number of small sales made at slightly better prices. By-product coke sells on a parity with Connellsville at $5.55 to $5.80 per ton, St. Louis delivery.

Finished Iron and Steel.—Quantities moving and being ordered are not very much different from recent weeks. In standard steel rails the only transaction for the week was one of 500 tons bought by a lumber road. Steam railroads are showing more interest in standard section rails. Nothing is actually in sight in the way of extension or new work or replacement. Plates have shown no life and no car orders are appearing. Prices are held, nominally at 1.30c., but as a matter of fact all transactions are being handled on their individual merits so far as structural material is concerned.

Old Material.—The only evidence of encouragement seems to lie in an increasing disposition on the part of dealers to buy attractive lots at favorable prices to lay

down in the yards against an advance. The quotations are somewhat irregular, but are based on actual conditions. The rolling mills of this vicinity are practically all idle and therefore taking absolutely no material. The foundries are in better shape, although not all of them are operating to full capacity and one or two have closed for repairs, inventory, etc. Lists out during the past week and which closed at very low prices included one of 2000 tons from the Missouri Pacific, one of 2000 tons from the Missouri, Kansas & Texas, one of 1800 tons from the Wabash, one of 700 tons from the Mobile & Ohio and several smaller lots. These large lots helped to hold prices down, particularly as there was practically no active bidding from outside interests. Relaying rails are active in demand, hard to get and well held at quotations. We quote dealers' prices f.o.b., St. Louis, as follows:

Per Gross Ton.

Old iron rails	$10.25 to $10.75
Old steel rails, rerolling	10.75 to 11.25
Old steel rails, less than 3 feet	9.25 to 9.75
Relaying rails, standard section, subject to inspection	23.00 to 24.00
Old carwheels	10.25 to 10.75
Heavy melting steel scrap	8.75 to 9.25
Shoveling steel	7.75 to 8.25
Frogs, switches and guards cut apart	8.75 to 9.25

Per Net Ton.

Iron angle bars	$8.75 to $9.25
Steel angle bars	7.25 to 7.75
Iron car axles	15.75 to 16.25
Steel car axles	10.25 to 10.75
Wrought arch bars and transoms	10.25 to 10.75
No. 1 railroad wrought	7.75 to 8.25
No. 2 railroad wrought	7.25 to 7.75
Railroad springs	7.00 to 7.50
Steel couplers and knuckles	7.00 to 7.50
Locomotive tires, smooth	8.75 to 9.25
No. 1 dealers' forge	6.25 to 6.75
Mixed borings	2.25 to 2.75
No. 1 busheling	6.25 to 6.75
No. 1 boilers, cut to sheets and rings	3.25 to 3.75
No. 1 cast scrap	9.00 to 9.50
Stove plate and light cast scrap	6.25 to 6.75
Railroad malleable	6.75 to 7.25
Agricultural malleable	6.25 to 6.75
Pipes and flues	4.25 to 4.75
Railroad sheet and tank scrap	3.25 to 3.75
Railroad grate bars	5.75 to 6.25
Machine shop turnings	3.25 to 3.75
Bundled sheet scrap	3.75 to 4.25

The Broad Iron Company, St. Louis, has opened offices at 1219 Pierce Building and will conduct a general scrap iron business as well as handle all its kindred lines, such as new iron and steel, plates, shapes, bars, etc.: also all kinds of new and old metals. Mr. Broad, formerly president of the Interstate Scrap Iron Company, of St. Louis, will be in active charge.

The A. Wolfe Iron & Metal Company, St. Louis, has been incorporated with a capital stock of $30,000, by Abraham Wolfe, David H. Cohen and others, to conduct a business in old material.

British Iron Market Is Quiet

Blast Furnaces Continue to Close—A Mexican Tin-Plate Order Gone to United States

(By Cable)

LONDON, ENGLAND, December 10, 1913.

Essential conditions are unaltered. The tone all round is quiet. Blast furnaces continue to close. Small inquiry is reported for semi-finished steel, but the tendency is steadier and there is a lot of business to be done. A Mexican order for tin plates has gone to America. Stocks of pig iron in Connal's stores are 147,859 gross tons, against 152,150 tons two weeks ago. We quote as follows:

Tin plates, coke 14 x 20, 112 sheets, 108 lb., f.o.b. Wales, 12s. 7½d. ($3.07).

(The following prices are per ton of 2240 lb.):

Cleveland pig-iron warrants (Tuesday), 49s. 7½d. ($12.05), against 49s. ½d. ($11.93) one week ago.

No. 3 Cleveland pig iron, makers' price, f.o.b. Middlesbrough, 49s. 6d. ($12.03).

Hematite pig iron, 61s. ($14.84), f.o.b. Tees.

Ferromanganese, £9 4s. 9d. ($44.95).

Steel sheet bars (Welsh), delivered at works in Swansea Valley, £4 15s. ($23.11).

Steel bars, export, f.o.b. Clyde, £6 5s. ($30.48).

Steel joists, 15-in., export, f.o.b. Hull or Grimsby, £5 12s. 6d. ($27.37), against £5 15s. ($27.98) one week ago.

Steel ship plates, Scotch, delivered local yards, £6 17s. 6d. ($33.46).

Steel black sheets, No. 28, export, f.o.b. Liverpool, £9 ($43.80).

Steel rails, export, f.o.b. works port, £6 5s. ($30.41).

(The following prices are per export ton of 1015 kilos, equivalent to 2237.669 lb.):

German sheet bars, f.o.b. Antwerp, 82s. 6d. ($20.07).

German 2-in. billets, f.o.b. Antwerp, 80s. ($19.46).

German basic steel bars, f.o.b. Antwerp, £4 11s. to £4 12s. ($22.13 to $22.37).

German joists, f.o.b. Antwerp, £5 5s. to £5 8s. ($25.55 to $26.28).

(By Mail)

End of the Rebate System of Scotch Steel Makers — Market Talk a Shade Better

LONDON, November 29, 1913.

An inglorious end has come to the rebate scheme in the steel trade, launched with such a flourish of trumpets a couple of years ago. It is too early yet to forecast what effect it will have on the market, but there is no doubt that the Scotch makers anticipate that it will benefit them considerably. In all about 23 firms were committed to the plan, and these formed themselves into three groups, one for the English Midlands, one for the North East coast, and one for Scotland. It is rather curious that while the last named was the hottest advocate of the plan it has developed into its bitterest critic, and has ended by throwing it over, while the other sections of the trade have retained it. The merchants in Scotland really killed the scheme, for they imported huge quantities of ship plates, etc., from abroad and the Clyde shipbuilders are full of foreign steel which they are taking on contracts. The plan of granting home consumers of steel a rebate of 5s. a ton on certain materials on condition that the said consumers purchased nothing in such lines outside the members of the association was bound to come to grief sooner or later, and unless matters mend the remaining sections of the trade will probably be forced into the same position as that taken up by the Scotchmen. The direct result of the scheme has been enormously to stimulate the buying of foreign steel here, and the acuteness of the position has been aggravated by the falling off in trade. Meantime it has been agreed that the two English associations shall continue the rebates. The secession from the Scottish end of the organization of the Lanarkshire Company was expected, and it follows hard upon the heels of the secession of the Glengarnock works.

An effort is being made to see things better in the general market and plenty of talk is heard as to improved demands and stiffer prices on the part of makers; but it is doubtful if improvement can proceed far, seeing the hungry condition of the continental works as a rule. Certainly some of them have booked themselves very well in bars, but in plates and sheets there is fierce competition for business, and invoices come to hand within a week—sometimes in even less time—of the day when specifications are posted. This reveals the state of the land. In semi-finished steel a moderate business is passing, but limited to small lots only, and these for the most part for early delivery. The time is approaching, however, when the big consumers will be in the market and already some of these are nibbling. When some big lines are done it will be possible more closely to test the market. At present sheet bars are quoted at about 80s., f.o.b. ($19.46), by the Belgians, while the Germans talk of 82s. 6d. f.o.b. ($20.07). At this figure they certainly cannot sell today, but if it should happen that the Belgians and French clear themselves out, then buyers will have to fall back on the Germans, in which event there would certainly be an advance in prices.

A lot of booking has been going on in tin plates, but prices are very poor and at last the Welsh steelmakers have reduced their figure for bars. Nominally this has stood at 96s. 3d. ($23.41) for some time, though it was possible to buy at less. This week they have reduced it to 91s. 3d. ($22.20) delivered, but it is very doubtful if they can do substantial business on this basis, in view of the attitude of foreign makers.

Pig Iron May Be Moved to Philadelphia

The pig-iron market has been a little stiffer this week, and there is a bare chance that a part of the Cleveland pig iron held so tenaciously on American account may at last be shipped from the Tees to Philadelphia. In view of the heavy fall in the price it might be just as well to ship it as to resell it here, and there is a possibility that if the news leaked out that,

say, a cargo of 5000 tons was to be dispatched to America it would put up prices and enable the balance of the material held to be liquidated on better terms than otherwise obtainable. At all events there are inquiries in the freight market now which seem to be serious, for tonnage for Philadelphia, and the matter may likely enough crystallize. In all essentials the pig-iron position is unchanged. Producers continue to complain bitterly that selling prices do not leave them a profit, and their threat to put out blast furnaces is no idle one, as can be seen from the returns of active furnaces. Another stack has been put out in Scotland this week, making 78 active against 88 a year ago, while in the Middlesbrough district there are 79 going compared with 89 a year ago, and in both areas a further closing down is expected. Loud complaint is made of the excessive cost of fuel, but there is no immediate relief in sight here, though matters may mend with the turn of the year. Coke makers are firm enough at the moment, however.

Buffalo

BUFFALO, N. Y., December 9, 1913.

Pig Iron.—New orders have not quite equaled those of the preceding week, but the total was about 12,000 tons of foundry and malleable. A considerable proportion was malleable, including a sale of 2000 tons to the Ramapo Iron Works. Extremely low prices have been made for all grades, but no special effort is being put forth by producers to induce users to come into the market, as it is apparent that even the present low level is not an incentive to buying and that very few users are ready to place orders for forward requirements. Canadian business has fallen off even to a larger extent than on this side of the border. Prices have weakened somewhat but not enough to warrant the scaling down of last week's quotations, which, where a single figure is given, represent the average of ordinary transactions, sales being made at lower and at higher prices:

No. 1 foundry	$13.50
No. 2 X foundry	13.25
No. 2 plain	13.00
No. 3 foundry	13.00
Gray forge	13.00
Malleable	$13.00 to 13.50
Basic	13.50 to 14.00
Charcoal	15.50 to 16.50
Charcoal, special brands and analysis	17.00 to 19.50

Old Material.—Demand remains small in all lines. Borings and turnings still move more freely than any other commodity. Heavy melting steel also shows a little better inquiry than for some weeks. Prices remain unchanged. We quote as follows per gross ton, f.o.b. Buffalo:

Heavy melting steel	$9.75 to $10.50
Boiler plate, sheared	11.50 to 12.00
Bundled sheet scrap	6.00 to 6.50
No. 1 busheling scrap	9.00 to 9.50
No. 2 busheling scrap	6.00 to 6.50
Low phosphorus steel scrap	15.75 to 16.25
Iron rails	15.00 to 15.50
No. 1 railroad wrought	12.00 to 12.50
No. 1 railroad and machinery cast scrap	12.00 to 12.50
Steel axles	17.00 to 17.50
Iron axles	22.50 to 23.00
Car wheels	11.75 to 12.25
Railroad malleable	11.00 to 11.50
Locomotive grate bars	9.50 to 10.00
Stove plate (net ton)	9.75 to 10.00
Wrought pipe	8.50 to 9.00
Machine shop turnings	5.00 to 5.50
Heavy steel axle turnings	8.00 to 8.75
Clean cast borings	5.50 to 6.00

Finished Iron and Steel.—An increase in the number of orders is noted. They are for small quantities and represent actual needs. The small buying is also regarded as evidence that prices are not yet at bottom. Sellers, however, display a feeling of optimism and believe that in four to six weeks there will be a decided change for the better. Prices to-day are 1.25c. to 1.30c. on bars and shapes, 1.25c. representing the market for the more attractive specifications with rumors that better could be done. On plates 1.25c. is the ruling price, although it is stated that lower has been quoted by smaller mills on desirable specifications. Cold rolled shafting is lower and 63 to 64 per cent. from list can now be obtained, the latter applying on large tonnage orders. Specifications for tin plate are coming in on contracts placed some weeks ago. The taking of bids for the club house, Order of the Eagles, 200 tons, has been deferred one week. The Commission of Public Works, Buffalo, has been authorized to award the South Side high school to George Baker Long, Worcester, Mass., and the subcontract for the steel, about 1100 tons, is soon to be let. The Buffalo Structural Steel Company has 100 tons for two buildings for the Federal Telephone Company, Buffalo, and the Onondaga Structural Steel Company, Syracuse, 100 tons for the Thomas Millen Cement Company's storehouse, Jamesville, N. Y.

New York

NEW YORK, December 10, 1913.

Pig Iron.—One New York State foundry, whose product is chiefly carwheels, closed in the past week for 2000 tons of malleable pig iron. The deliveries called for extend well into 1914, or farther than the average furnace company cares to sell. The price is understood to have been a shade under $13 at Buffalo furnace. In this market several inquiries have appeared, including one of 600 to 700 tons for a New England pump works, and one of several thousand tons for an open-hearth plant in New England. Foundries seem to be making the iron covered by their present contracts go farther than was anticipated, and the market is not expected to be really active for some time. The range of prices on eastern shipments from the Buffalo district is greater than usual, running from $13 to $13.75 for No. 2 X. A considerable sale of basic, presumably 6000 tons, has been made to the same interest in the Buffalo district that recently bought malleable iron. Furnaces outside the Buffalo district quoted on this business but $12.75 to $13 at such furnaces, with a freight of $1.40 to the consuming point, brought the delivered price considerably above what could be done at Buffalo. Some of the low prices recently made on foundry iron shipped from eastern Pennsylvania are not now so readily obtainable, but steel company iron can be had at prices below what some merchant furnaces will entertain, the range at furnace in Lehigh and Schuylkill Valleys being $14.25 to $14.75 for No. 2 X. We quote Northern iron for tidewater delivery as follows: No. 1 foundry, $15.25 to $15.50; No. 2 X, $15 to $15.25; No. 2 plain, $14.50 to $15. Southern iron is quoted at $15.50 to $15.75 for No. 1 foundry and $15 to $15.25 for No. 2.

Finished Iron and Steel.—Importations of either finished or semi-finished steel seem quite unlikely and developments lead to the conclusion that present prices cannot justifiably be claimed as a result of a threatened inflow of foreign material. For example, a late quotation for structural material from a German maker, and for a round tonnage of few lengths and generally attractive from the mill standpoint, was £5 15s. 6d. per gross ton in ship in harbor. This corresponds to 1.25c. per lb. To this must be added 10 per cent. for duty; about 0.05c. for lighterage; 0.025c. for financing, a total of 1.45c., New York, even if it could be delivered directly from lighter to buyer. If, however, as would ordinarily be the case, the steel would have to be delivered to a point not on seaboard but within the metropolitan district, there would be an additional charge of 0.07c. for freight, making the cost equivalent to 1.36c., Pittsburgh, without any allowance whatever for profit to the importer, nor, indeed, for the mill inspection, which most importers regard as essential as their own safeguard. Generally, foreign makers are not taking seriously the possibility of doing business with America, and another factor is noticed in the United States that, other things being equal, home buyers would hesitate to buy abroad for fear that they might at some future time find American makers loth to grant them quick deliveries. Emphasis is placed on the fact that costs of manufacture are higher abroad than heretofore—in short, competition is nearer the same basis than has ever existed. It is felt that foreign makers would hesitate to make lower prices needed to get American business, for the effect that such prices would have on the rest of their markets. Business in most lines is confined to small lots with a fair tonnage involved, one Eastern plate mill reporting operations to about 65 per cent of capacity. Prices, it is thought by many, will remain firm from now on at the present low figures. In structural lines only one inquiry of any size is noted, this for six bridges for the New York, New Haven & Hartford Railroad calling for 500 tons, but figures will soon be asked on the large tonnage required for the new ship piers in New York. The principal contracts closed are the St. Regis School, New York, 800 tons, awarded to Levering & Garrigues Company; Murchison National Bank, Wilmington, N. C., 650 tons, to the Lackawanna Steel Company, and the Carpenter office building, Boston, 550 tons, to the

New England Structural Company. Of the 90,000 tons for the subway work, New York, now before the market, only 10,000 has been definitely awarded. This has gone to the American Bridge Company through the Degnon Contracting Company, embracing 4600 tons for route 50 and 5500 tons for routes 19 and 22. Rumors of other subway awards could not be confirmed. Prices are indefinite owing to the few transactions of size taking place, but it is noted that some general contractors are figuring the plain material in their estimates at 1.10c., Pittsburgh. Rerolled reinforcing bars have been closed at 1.20c., Buffalo. We quote mill shipments of steel bars at 1.25c., Pittsburgh, or 1.41c., New York, although 1.20c. is widely acknowledged as the market without, however, records of actual sales at that figure. Steel plates and plain structural material are 1.20c. to 1.25c., with some makers holding for 1.30c., Pittsburgh. We quote for refined iron 1.30c. to 1.35c., New York. Iron and steel bars from store are 1.90c. to 1.95c., and shapes and plates, 1.95c. to 2c.

Cast-Iron Pipe.—No new municipal lettings are announced in this immediate territory. General buying of standard pipe is exceedingly light, as is usual at this season. Founders report a moderate amount of business in special pipe for use in connection with manufacturing establishments and for purposes outside of the ordinary conveyance of gas or water. Competition is keen for all business now coming up, and carload lots are quotable at $22 to $23 per net ton, tidewater, for 6 in.

Old Material.—The demand shows no improvement. Consumers, however, are sufficiently interested to make an occasional inquiry with regard to prices, but little business results. Dealers have not altogether lost hope, but look forward to some revival of buying in January. Steel scrap offers the best prospects in this direction, but rolling-mill scrap seems to be almost without friends. Foundries are taking some cast scrap, but only in small quantities. Dealers' quotations are as follows, per gross ton, New York:

Old girder and T rails for melting	$7.50 to $8.00
Heavy melting steel scrap	7.50 to 8.00
Relaying rails	20.50 to 21.00
Rerolling rails	10.00 to 10.50
Iron car axles	18.50 to 19.50
Steel car axles	12.50 to 13.00
No. 1 railroad wrought	10.25 to 10.75
Wrought-iron track scrap	9.00 to 9.50
No. 1 yard wrought, long	8.50 to 9.00
No. 1 yard wrought, short	7.75 to 8.25
Light iron	2.50 to 3.00
Cast borings	4.00 to 4.25
Wrought turnings	4.00 to 4.25
Wrought pipe	6.00 to 6.50
Carwheels	10.50 to 11.00
No. 1 heavy cast, broken up	10.00 to 10.50
Stove plate	7.00 to 7.50
Locomotive grate bars	6.50 to 7.00
Malleable cast	7.00 to 7.50

Ferroalloys.—Since the reduction last week of $3 per ton in the producers' price for ferromanganese there have been sales of about 300 tons at this price, which is $47, Baltimore, and which remains the present quotation. In addition to this there are inquiries for about 500 tons. We continue to quote 50 per cent. ferrosilicon at $75, Pittsburgh, for carloads; $74 for 100 tons, and $73 for 600 tons and over.

Metal Market

NEW YORK, December 10, 1913.

The Week's Prices

Cents Per Pound for Early Delivery

	Copper, New York			Lead		Spelter	
Dec.	Lake.	Electrolytic.	Tin, New York.	New York.	St. Louis.	New York.	St. Louis.
4	15.00	14.50	38.10	4.10	3.95	5.15	5.00
5	15.00	14.50	38.25	4.10	3.95	5.15	5.00
6	15.00	14.50	.....	4.10	3.95	5.15	5.00
8	15.00	14.37½	37.60	4.10	3.95	5.15	5.00
9	15.00	14.37½	37.35	4.00	3.85	5.15	5.00
10	15.00	14.37½	37.50	4.00	3.85	5.15	5.00

Lower prices are inducing no business in copper. Tin is quiet at lower prices. Lead has further declined, but the market is quiet. Spelter is unchanged. Antimony is dull and weaker.

New York

Copper.—The market has continued extremely dull. Reports have been heard of a better demand in Europe which resulted in some buying of electrolytic, but the trade here is skeptical as to any large amount of business having been done. Certainly, whatever buying there was abroad did not stir up any action here despite the fact that consumers are believed to be almost bare of supplies. There has been no business in Lake copper, either, and the quotation of 15c. is purely nominal. The Producers' statement for November, which showed a decrease of nearly 20,000,000 lbs. in November deliveries and an increase in stocks of over 15,000,000 lbs., the statistics being given in full elsewhere in this issue, was as expected and the statement excited very little comment or interest. Electrolytic is quoted to-day at 14.37½c. and it is probable that sellers would take business at a still lower figure, as they are anxious for some sort of activity. London quotes spot copper to-day at £65 2s. 6d. and futures at £64 5d. Exports this month total 7708 tons.

Pig Tin.—This metal has been dull in both New York and London, although sales of futures in London have increased in volume. Prices have declined steadily abroad, which is charged entirely to the lack of interest in the market. Some indication is desired as to what the future is to bring before operators will take hold, a situation which is reflected here and the market everywhere is a waiting one. Domestic consumers have continued to look around more or less for future tin and some business has been done for January, February and March deliveries, but not enough to be of importance. Prices are low, with early delivery quoted at 37.50c., and are beginning to look attractive to buyers. The price to-day is below the import cost. There is ample stock available for all needs. London quotes spot at £171 and futures at £172 10s. The arrivals this month total 1265 tons and there is afloat 1545 tons.

Lead.—Light demand and greater weakness have been features in lead. The largest producer yesterday reduced its price $2 a ton, or to 4c., New York, which is a very low figure. The St. Louis price is 3.85c. The metal has not been on the same level since February, 1912, and at that time some of the mines began preparations to curtail production. At present prices there is little profit for producers and the situation is proportionately attractive to buyers and this may lead to a speculative buying movement. There are several reasons held responsible for the low quotations, among them the reduced tariff, the slight demand resulting from general business conditions, the fact that this is the dull season for the metal and also the time when ore contracts are entered. The new tariff is having only an indirect effect for the reason that the metal on the other side is higher relatively than it is here and it would cost 4.70c. to bring foreign lead into this country. Such business as came up has been keenly competed for.

Spelter.—Quotations are unchanged at 5.15c. to 5.20c., New York, and 5c., St. Louis, with the market quiet and uninteresting.

Antimony.—The only feature in this metal is the plentiful supply, for which there is little or no demand. Hallett's is quoted at 7c. to 7.25c., Cookson's at 7.40c. to 7.50c. and Chinese and Hungarian grades at 6c. to 6.50c.

Old Metals.—The market is extremely dull. Dealers' selling quotations are unchanged, being nominally as follows:

	Cents per lb.
Copper, heavy and crucible	14.00 to 14.25
Copper, heavy and wire	13.50 to 13.75
Copper, light and bottoms	12.25 to 12.50
Brass, heavy	8.50 to 8.75
Brass, light	7.50 to 7.75
Heavy machine composition	12.25 to 12.50
Clean brass turnings	8.50 to 8.75
Composition turnings	10.75 to 11.00
Lead, heavy	3.90
Lead, tea	3.65
Zinc, scrap	4.10

Chicago

DECEMBER 8.—Continued weakness in copper reflects the marked lack of interest in future buying, although metal for prompt delivery is still moving freely. Lower prices for lead, tin and sheet zinc are being quoted. We quote as follows: Casting copper, 15c.; Lake copper, 15.25c., for prompt shipment; small lots, ¼c. to ½c. higher; pig tin, carloads, 39c.; small lots, 41c.; lead, desilverized 4.05c. to 4.10c., and corroding, 4.45c. to 4.60c. for 50-ton lots; in carloads, 2½c. per 100 lb. higher; spelter, 5.10c. to 5.15c.; Cookson's antimony, 9.50c.; other grades, 8c.; sheet zinc, $7.25, f.o.b. La Salle or Peru, Ill., less 8 per cent. discount in carloads of 600-lb. casks. On old metals we quote buying prices for less than carload lots as follows: Copper wire, crucible shapes, 12.25c.; copper bottoms, 10.75c.; copper clips 11.75c.; red brass, 11c.; yellow brass, 8c.; lead pipe 3.60c.; zinc, 3.60c.; pewter, No. 1, 23c.; tin foil, 29c.; block tin pipe, 32c.

St. Louis

DECEMBER 8.—The metal markets have been dull and lower the past week, but there is a slightly better feeling to-day, despite the low figures prevailing. Lead closed at 3.95c. to 4c.; spelter, 4.95c. to 5c.; Lake copper, 15.35c. to 15.85c.; electrolytic copper, 14.85c. to 15.10c.; tin, 37,85c. to 38.10c.; Cookson's antimony, 7.80c. to 7.95c. In the Joplin ore market there was a decided slump, and 60 per cent. zinc blende ranged from $39 down to $37 per ton, the highest settlement for best grades being $42. Calamine, 40 per cent., ranged from $19 to $20, with the top settlement at $25. Lead ore was still lower for the week, dropping $2.25 per ton to $49.50 for the best 80 per cent. galena. On miscellaneous scrap metals we quote as follows: Light brass, 5c.; heavy yellow brass, 7.50c.; heavy red brass and light copper, 10c.; heavy copper and copper wire, 11c.; zinc, 2.75c.; lead, 3c.; pewter, 22c.; tinfoil, 28c.; tea lead, 2.75c.

Iron and Industrial Stocks

NEW YORK, December 10, 1913.

Stocks have advanced quite generally since last report, largely because the President's message to Congress contained nothing to be construed as prejudicial to business interests. The improvement continued until Tuesday when the stock market was disturbed by the announcement of a large issue of notes by the Canadian Pacific and by the intimation that Attorney General McReynolds had called on the New York Central to divest itself of its leased or controlled lines paralleling its main system. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week was as follows:

Allis-Chalm., com...	7⅞- 8	Pressed Steel, com..	25¾- 26
Allis-Chalm., pref...	41⅜- 42½	Pressed Steel, pref.....	96
Am. Can, com.....	26⅛- 28	Railway Spring, com.....	24
Am. Can, pref.....	87¼- 88⅝	Republic, com.....	19 - 19¾
Am. Car & Fdy., com.	43¼- 44	Republic, pref.....	80 - 81
Am. Car & Fdy., pref.....	112½	Rumely Co., com....	14¾- 15
Am. Loco., com.....	30 - 31	Rumely Co., pref...	35¾- 36
Am. Loco., pref....	97 - 98	Sloss, com.	26½
Am. Steel Foundries.	25 - 26⅛	Pipe, com.....	10⅛
Bald. Loco, com....	39½- 40	U. S. Steel, com....	55½- 57⅞
Bald. Loco., pref...104½-105½		U. S. Steel, pref....104¾-105⅜	
Beth. Steel, com....	29 - 30⅝	Westinghouse Elec..	64 - 65⅝
Beth. Steel, pref....	69 - 69¾	Chic. Pneu. Tool.....	50
Case (J. I.), pref...	94¾- 95	Cambria Steel	47⅛- 48
Colorado Fuel	27 - 28¾	Lake Sup. Corp.....	22
Deere & Co., pref...	94 - 94⅜	Pa. Steel, pref.....	62
General Electric.....138 -140		Warwick	10
Gt. N. Ore Cert....	31¾- 33½	Crucible Steel, com.	14 - 14½
Int. Harv., com.....101½		Crucible Steel, pref.	89 - 90
Int. Harv., Corp...101½-102		Harb. Walk Ref., pref....	99
Int. Pump, com.....	4½- 5	La Belle Iron, com.	36 - 37
Int. Pump, pref....	16 - 17	La Belle Iron, pref.....116⅞	
Lackawanna Steel.....	30		

Dividends Declared

The La Belle Iron Works, regular quarterly, 2 per cent. on the preferred stock, payable December 20, and ½ of 1 per cent. on the common stock, payable January 31.

The Railway Steel Spring Company declared, regular quarterly, 1¾ per cent. on the preferred stock, payable December 20.

The Baldwin Locomotive Works, regular semi-annual, 3½ per cent. on the preferred and 1 per cent. on the common stock, both payable January 1.

The Ingersoll-Rand Company, regular semi-annual, 3 per cent. on the preferred stock, payable January 2.

The J. I. Case Threshing Machine Company regular quarterly, 1¾ per cent. on the preferred stock, payable January 1.

The Canadian Locomotive Company, regular quarterly, 1¾ per cent. on the preferred stock, payable January 2.

The American Car & Foundry Company, regular quarterly, 1¾ per cent. on the preferred stock and ½ of 1 per cent. on the common stock, both payable January 1.

The Bethlehem Steel Company, regular quarterly, 1¼ per cent. on the preferred stock, payable January 2.

The Continental Can Company, regular quarterly, 1¾ per cent. on the preferred stock, payable January 1.

The Moline Plow Company, regular quarterly, 1¾ per cent. on the first preferred stock and 1½ per cent. on the second preferred stock, both payable December 1.

The American Can Company, regular quarterly, 1¾ per cent. on the preferred stock, payable January 2.

The Western Electric Company, regular quarterly, 2 per cent. and extra 2 per cent., both payable December 31.

The American Rolling Mill Company, Middletown, Ohio, announces that its plant at Zanesville, Ohio, resumed operations, with a full force, December 8.

Philadelphia Foundrymen's Association

Nominations for officers to serve for the coming year was the most important business before the Philadelphia Foundrymen's Association at its regular monthly meeting, held at the Hotel Walton on the evening of December 3. The nominating committee, consisting of C. D. Matthews, George C. Davis and George Davies, announced the following candidates: President, Thomas Devlin, Thomas Devlin Mfg. Company; vice-president, August A. Miller, Philadelphia representative of *The Iron Age;* treasurer, Josiah Thompson, J. Thompson & Company; secretary, Howard Evans, J. W. Paxson Company; executive committee, Walter Wood, R. D. Wood & Co.; Thomas M. Eynon, Eynon-Evans Mfg. Company; H. L. Haldeman, Pulaski Iron Company; Walter T. MacDonald, Schaum & Uhlinger, all of Philadelphia, and Walter S. Bickley, president Penn Steel Casting & Machine Company, Chester, Pa. As trustees, Thomas Devlin, Josiah Thompson and Howard Evans were named, with George C. Davis as official chemist. All the above succeed themselves, except the candidate for vice-president, who is nominated to succeed the late Dr. Elmer E. Brown.

President Thomas Devlin, as delegate of the association to the Atlantic Deeper Waterways Convention, reported a deficiency in financing that gathering. To assist in meeting this the association contributed $50.

The Herman Pneumatic Molding Machine Company, Zelienople, Pa., represented by A. M. Frauenheim, 515 Stephen Girard Building, Philadelphia, was elected to active membership.

Following the business session, Powell Evans, chairman of the Philadelphia Fire Prevention Commission, and president of the Merchant & Evans Company, Philadelphia, made an interesting address on "Fire Protection and Waste."

The International Harvester Company has added 100 men to its foundry force at its Milwaukee works, Milwaukee, Wis., bringing this department up to about 75 per cent. of its capacity under the most favorable conditions. The entire Milwaukee plant has been running at about 50 per cent. of normal capacity the last six months, but Burton C. Wait, general manager, states that the order to increase the foundry force will doubtless be followed by increases in other departments, due to improved business.

Some experimenting has been carried out on the effect on steel of the rare elements uranium and tantalum, but the scope has been limited because of inability to secure ferroalloys of these elements in sufficient quantities. It has been found that steels of great hardness can be made by the use of tantalum. Greater supplies of both ferrouranium and ferrotantalum are now promised from an English source and it is expected that the data regarding steel made with these alloys will be increased.

A new labor organization, bound by its constitution to oppose strikes and uphold arbitration for settling disputes and also to favor a graduated rather than a uniform wage scale, was chartered in the Circuit Court at Kansas City, Mo., November 29. Founders of the organization, which is to be known as the National Association of United Building Labor, say it is their plan to extend the body to all parts of the United States. So far 200 members have been enlisted in Kansas City.

Several of the leading importers of iron ore at Dortmund Harbor, Germany, have established electrically operated ore crushers, the practice hitherto having been to do it by hand. The new circular crushers have a hight of about 28 ft. and when dealing with Kiiruna ore from Sweden have a capacity of from 250 to 300 tons per hour.

A patent (1,078,619) has been awarded to Albert E. Greene, Chicago, for a resistor furnace for melting. The invention relates to furnaces in which heat is generated by electric currents induced in an electrical resistor. The object is to combine the heating effects of both primary and secondary transformer currents.

German Exports and Imports in October

Germany's exports of iron and steel in October reached 588,811 metric tons, which was only surpassed last March, when the movement was nearly 11,000 tons greater. The exports for 10 months ended with October amounted to 5,390,512 tons, or 473,000 tons more than in the corresponding period last year. The exports of the principal products for October and for 10 months, compared with 1912, were as follows, in metric tons:

	October		January-October	
	1913	1912	1913	1912
Pig iron	51,237	89,175	676,150	849,525
Scrap	15,764	13,533	162,813	124,502
Semi-finished steel	77,057	65,263	570,354	556,676
Structural shapes	29,872	47,578	392,467	410,262
Bars	128,053	72,005	956,837	688,145
Steel rails	44,582	42,191	418,407	432,534
Other track material	9,045	13,646	108,573	144,794
Railroad rolling stock	11,314	11,102	94,740	89,216
Heavy plates	42,117	25,722	375,643	241,410
Medium and fine plates	16,587	9,599	118,265	101,851
Steel tubing	28,266	17,420	246,757	182,079
Wire	40,378	40,603	379,866	355,150
Wire nails	5,566	5,047	54,495	44,189

Germany's imports and exports of all forms of iron and steel as well as machinery during the months of January to October inclusive, compared with the corresponding period in 1912, were as follows in metric tons:

	Imports		Exports	
	1913	1912	1913	1912
Iron and steel	520,663	557,328	5,396,512	4,923,935
Machinery	77,643	68,661	466,514	430,426
Total	598,306	625,989	5,863,026	5,354,361

While the imports of iron and steel fell off in 1913, those of machinery increased, whereas the exports of both kinds of material showed a total increase of 508,665 metric tons.

Removing Overburden from Ore by Dredge

A hydraulic suction dredge has been introduced into the iron mining industry in Minnesota. It was built by the Interstate Iron Company, Grand Rapids, Minn., to open and mine iron properties, which are the first to be opened in the vicinity. The dredge has a 500-hp. boiler and engine equipment and two hydraulic pumps. The earth is forced by the pumps through a 10-in. pipe, and can be forced a distance of more than a mile. The dredge will dispose of the earth over the ore, making the mine an open pit. After the dredge has worked its way over the ore body, a dam will be built to keep the water of the river out of the pit, and only enough will be let in to float the dredge. The ore at the point at which it will be mined lies about 65 ft. below the surface.

A New Frick Electric Furnace.—The Eastern Metals Corporation, with offices in the Forty-second Street Building, 30 East Forty-second street, New York, has contracted with the Siemens & Halske Company, 90 West street, New York, for one 2-ton Frick induction electric furnace for its plant at Bayonne, N. J. The furnace will be of the new type, which is the double ring and single phase, and will be the first one of this design in this country.

At a meeting of the directors of the American Rolling Mill Company held December 2, at Middletown, Ohio, a stock dividend of 25 per cent. on the common was announced. The remaining 12,000 shares of the recently authorized 28,000 shares of common were sold at $150 per share. The proceeds of the sale are to be used to retire $1,500,000 outstanding notes and to increase the working capital. This increases the common stock to $8,000,000.

In an article in the Railway Age Gazette of November 21 on the steel passenger car situation it is stated that it will be necessary to provide 47,000 cars to replace all the wooden and composite cars in use. The cost is put at $614,619,100 on a basis of building 46,926 cars. One steel car builder says that all-steel passenger coaches cost from $14,000 to $17,000 each, averaging about $15,000.

The Griffin Mfg. Company, Erie, Pa., manufacturer of hinges and butts, barn door hangers and other specialties, is making some additions to its works. It will build in its own shops all the new equipment needed.

New Electric Steel Casting Plant

A new electric steel plant has just been started on the Pacific coast at Redondo, Cal., by the Warman Steel Casting Company, which is producing small and medium-sized steel castings. The furnace employed is the pure Stassano type and said to be the first one in the United States. The company, according to Metallurgical and Chemical Engineering, was organized three years ago and has been producing crucible steel castings, but decided to adopt another process. It desired to produce castings of at least 1600 lb. in weight, which is almost impracticable in a small crucible plant. The Stassano type was decided upon by the management, which was influenced largely by the adaptability of the 1-ton type of this furnace to a three-phase alternating current, thus doing away with the expense of a rotary transformer. The furnace has a capacity of 2000 lb. and can be tilted to pour either the entire charge at once into a big ladle or as required into small hand ladles. The Southern California Edison Company supplies alternating current at 10,000 volts and 60 cycles, and it will eventually be brought down to 100 and 150 volts respectively. The raw materials used are mis-runs, risers and gates which accumulated in great quantities from the crucibles, and a small percentage of shearings. The first heat was poured October 27.

A New Seamless Steel Tube Mill

The Detroit Seamless Steel Tubes Company, Detroit, Mich., is building a tube mill for which important claims are made. The company asserts that this mill is "more than an innovation; it is a milestone in the history of the manufacture of seamless tubes." The inventor of the mill is R. C. Stiefel, Ellwood City, Pa., who has built tube mills in not only the United States but in European countries. He is the inventor of the principal equipment now used in the Ellwood mills of the United States Steel Corporation. The new mill to be built in Detroit will aim at economy of production, it being stated that it will go considerably beyond the most advanced practice in this country or abroad. The company further states that the keynote in this advance is to be quality; that "the tubes from the new mill will be of a little better quality than ever known before."

Gulf States Steel Company Succeeds Standard

The Gulf States Steel Company, chartered in Delaware, is the new name of the reorganized Standard Steel Company of Birmingham, Ala., formerly the Southern Iron & Steel Company. Business was started under the new name on Monday, December 8, with James Bowron, president and A. R. Forsyth, secretary and treasurer. The capital stock totals $15,500,000, divided into $3,000,000 first preferred, $5,000,000 second preferred and $7,500,000 common. The company contemplates the addition of a billet mill, two open-hearth furnaces and a blast furnace to its plant at Gadsden, Ala.

The increasing business of the Richmond Forgings Corporation, Richmond, Va., maker of drop forgings, has made necessary the opening of a permanent office at Detroit, Mich., which for the present will be under the charge of Landon C. Wellford, as sales manager. Offices have been taken in the Dime Bank Building. The company has also arranged with A. O. Knudsen, of Newton Centre, a suburb of Boston, Mass., to look after its New England trade, which has become so important as to need a representative on the ground. Extensive additions have been made to the company's equipment, in anticipation of a heavy spring business.

At the bankruptcy sale held in New York City, December 3, a committee representing the bondholders of Milliken Bros., Inc., submitted the only bid for the plant. This is a part of the reorganization plan, which was outlined in *The Iron Age* of November 27, and it is expected that the committee will transfer the property to the reorganized company shortly, as it has been intimated that the sale will be approved by the court.

Personal

Philip H. Moore, lately mining engineer and manager for the Canadian Allis-Chalmers Ltd., mining, crushing and cement machinery department, has accepted the position of general manager of Rock & Power Machinery, Ltd., Toronto, Ont., with branch offices in Halifax, Montreal, Sudbury, Cobalt, Winnipeg, Calgary and Vancouver.

Henry U. Storrs, who has been connected with the sales department of the Chapman Valve Mfg. Company at Indian Orchard, Mass., for the past three years, has accepted the position of manager of the Boston office of the company, to fill the vacancy caused by the resignation of H. L. De Wolfe.

J. van Tiel, Hendrik van Tiel, Helmond, Netherlands, manufacturer of bolts and nuts, sailed for home December 9 after a seven weeks' stay in this country.

R. J. Southwell has been appointed to succeed the late R. B. Esten in charge of the New York office of the Clinton Wire Cloth Company at 261 Broadway.

W. L. Miles, formerly sales manager and secretary of Wickes Brothers, Saginaw, Mich., manufacturers of boilers and tanks, has been elected a director and vice-president of the Jackson & Church Company, Saginaw. This company has recently added several lines of heavy machinery, in the sale of which Mr. Miles has had extensive experience.

Director Schneider, of Bismarckhütte, is about to sail for Germany after a four weeks' visit here, during which he effected a new business connection.

D. F. S. Clark, for a number of years secretary of the Boston Branch, National Metal Trades Association, has resigned the office to take a position with J. C. Pushee & Sons, Boston, Mass., manufacturers of brushes. W. H. Weinger has been elected to the secretaryship of the branch, and will begin his duties about December 15.

T. T. Richards has been appointed assistant sales manager of the Wagner Electric Mfg. Company, St. Louis, Mo. He has been associated with the company's sales department for nine years, specializing in the marketing of its new devices as produced.

Joseph Monforts, a manufacturer of textile machinery in Germany, will sail for Europe December 16. He is planning the establishment of a new factory abroad and in the four weeks he has been here has been looking into machine tools.

Paul Negrier, civil engineer, Paris, France, is visiting a number of cities of the United States, having been commissioned by the French minister of commerce and industry to make investigations of American methods of handling various municipal problems of public works.

W. Hume Logan, president Dow Wire & Iron Works, and James Clark, Jr., president James Clark, Jr., Electric Company, are representatives of the Louisville machinery trade on the workmen's compensation committee of the Kentucky Manufacturers' and Shippers' Association, which will present a bill on this subject to the next session of the State Legislature in January.

Dr. Karl G. Frank, American representative of the Siemens & Halske Actiengesellschaft, Berlin, Germany, 90 West street, New York, returns this week from a trip to Europe.

F. Wendemuth, of Alfred H. Schutte & Co., Cologne, Germany, who came to this country to study American machine tools, will sail for home December 13.

The Mebane Mfg. Company, Cleveland, Ohio, has changed its name to the Case Hardening Service Company. The company has a plant on Sweeny avenue, but will shortly move into much larger quarters in a building that is being fitted for its purposes at 1410 West Tenth street. Its offices are in the Marshall Building. The company manufactures a line of case hardening compounds. W. E. Byrnes, formerly president Ohio Rubber Company, is the manager.

The new 84-in. plate mill now being built by the Alan Wood Iron & Steel Company at Ivy Rock, Pa., is expected to be ready for operation about February 1, 1914.

Obituary

WAKEFIELD BAKER, president Baker & Hamilton, San Francisco, Cal., died in that city December 7, aged 48 years. He had suffered for several months from heart disease and his death was not unexpected. Baker & Hamilton deal in hardware, farming implements, pipe and other iron and steel products and have branches in Sacramento, Los Angeles and Benicia, Cal., including the Benicia Iron Works where agricultural implements are manufactured. Mr. Baker entered the business when a young man and succeeded his father as president of the company. He was president also of the Pacific Portland Cement Company and a director in several banks and insurance companies. After the earthquake and fire which practically destroyed San Francisco in 1906, Mr. Baker was among the most energetic of those whose efforts rebuilt the city. He was prominent in the social life of the Pacific coast, having been a member of the Bohemian Club and president of the Pacific Club for several years. He was a son of Col. Livingston L. Baker, whose commission as an army officer was signed by President Lincoln. He leaves a widow, two sons and a daughter.

MAURICE BYRON PATCH, superintendent of the Buffalo Smelting Works, died December 3, from paralysis, at the home of a daughter in Derby, N. Y., where he was visiting. He was 61 years of age. He was born in Otisfield, Mass., and was a graduate of the Massachusetts Institute of Technology. In 1874 he was engaged as chemist for the Detroit & Lake Superior Copper Company at Houghton, Mich., and subsequently was appointed superintendent of the smelting plant, built after his design, at Lake Linden, Mich., by the Calumet & Hecla Mining Company. In January, 1891, he removed to Buffalo, forming the connection which he held at the time of his death. He was the executive head of that company, which he reorganized soon after becoming identified with it. He was known throughout the mining world as an expert metallurgist and chemist and as one of the best informed smelting authorities. He had been a member of the grade crossing commission of Buffalo for a number of years and was its chairman since 1912. He leaves a widow, three sons and two daughters. One of his daughters is married to William H. Barr, president of the National Founders' Association.

WILLIAM DEERING, founder of the Deering Harvester Company, Chicago, now part of the International Harvester Company, died at Miami, Fla., December 9, aged 87 years. He began the manufacture of harvesting machinery at Plano, Ill., in 1873. He had been retired for several years. He made his home at Evanston, Ill. He was born at Paris, Me., and was educated in the Readfield Seminary. Mr. Deering began his career in the woolen business, and later entered the wholesale dry goods business in Portland, Me., and New York. This was before he became interested in farming machinery.

THADDEUS S. WEED, Chester, Pa., at one time secretary of the late Combination Iron & Steel Company, Chester, died December 7 after a brief illness, aged about 55 years.

The Buffalo Forge Company, Buffalo, N. Y., reports that its Spiro steam turbines have met with steadily increasing sale, which has developed particularly along the lines of small direct-connected generating sets and steam-turbine-driven centrifugal blowers. On account of the superior economy, special attention has been paid to the development of 1 to 5 kw. lighting units, and orders are being received from several customers in quantities. Among such users are dredging contractors, manufacturers of locomotive cranes, quarry owners and manufacturers requiring auxiliary units for night load.

The Mount Union Refractories Company, Mount Union, Pa., has increased its capital stock from $300,000 to $500,000, to take care of the enlarged capacity of the plant. This plant, which was completed in July, 1912, with a capacity of 40,000 brick per day, was subsequently expanded to make 75,000 per day and more recently to 110,000 brick per day, except for the additional kilns needed. The company has sufficient crushing, grinding, molding and drying capacity, but will build seven more kilns to bring its burning capacity to correspond.

Pittsburgh and Valleys Business Notes

The report that the Aluminum Company of America, Pittsburgh, has started active work on a large new plant at Marysville, Tenn., is incorrect. Some time ago the company bought 600 acres of land near there and also some power, but it has not made plans for the building of a large plant on that land and may possibly locate at some other place. It has, however, decided to use the power bought, and for this purpose is erecting two buildings of steel construction, each about 40 x 341 ft. It will likely be some time before the company definitely decides whether to build a large plant at Marysville or at some other point in the South.

The Youngstown Sheet & Tube Company, Youngstown, Ohio, has closed a deal with J. V. Thompson, Uniontown, Pa., for the purchase of about 5000 acres of coal lands located in Greene County, Pa. The company does not expect to open up this property until next year, and is undecided whether to build coke ovens on the property or by-product coke ovens at Youngstown. A decision may be reached early in 1914.

The regular monthly meeting of the Pittsburgh Foundrymen's Association was held on Monday evening, December 8, in the rooms of the Engineers' Society, Oliver Building. A paper was read by Dr. Ernest P. Humbert, of the Electrode Company of America, Niagara Falls, N. Y., on "Electric Furnace Practice in the Foundry." Following this paper a series of moving pictures was presented by the National Tube Company, showing the manufacture of steel pipe from the ore to the finished product.

A report that the plant of the Harris Automatic Press Company will be removed from Niles to Warren, Ohio, is officially denied.

No. 3 blast furnace of the Carnegie Steel Company at its Ohio works, Youngstown, Ohio, was blown out on Friday, November 5. At present three out of six stacks at this plant are out of blast.

The Bessemer Limestone Company, Youngstown, Ohio, which manufactures building and paving brick, has decided to increase its capacity about 60 per cent., which will mean an increased production of 36,000,000 brick per year. The company's plant is located at Bessemer, Lawrence County, Pa. John Tod, Youngstown, is president of the company.

The Riverside Bridge Company, Martins Ferry, Ohio, has taken a contract for about 900 tons of structural steel for new buildings to be erected for the Mineral Point Zinc Company, Tiltonville, Ohio.

The city of Pittsburgh has granted permission to the Ford Motor Company, Detroit, Mich., to remove a portion of the bridge rail on the Atherton avenue bridge in Pittsburgh. This insures the erection of a plant there by the Ford Company, on which it is expected that from $600,000 to $800,000 will be expended.

The American Zinc Company, now building a plant near Burgettstown, Pa., is placing orders for the equipment. It has given a contract to the Pittsburgh office of the Babcock & Wilcox Company for 4000 hp. Rust water-tube boilers; to the General Electric Company for two 1500 kw. turbo-generator sets, and to the Pittsburgh office of the Wheeler Condenser & Engineering Company for condensing equipment. Contracts for other equipment will be placed shortly.

Clinton furnace, of the Clinton Iron & Steel Company at Pittsburgh, which has been completely rebuilt, has been put in operation on foundry iron. It is 77 ft. high and 18 ft. in diameter at the bosh. The hearth diameter is 12 ft. and the stock line diameter 12 ft. The furnace has been equipped with new ore bins, steel ore trestles and cranes.

The Roberts Gas & Gasoline Engine Company, recently organized with a capital stock of $150,000, and which proposes to build a plant at Morgantown, W. Va., is taking bids for the buildings and machine tools. Leopold Sigwart is president; Eugene Summerville, vice-president; H. P. Kennan, box 589, Morgantown, secretary; J. M. Roberts, general manager, and Frank Sigwart, superintendent.

At a meeting of the National Association of Window Glass Manufacturers held in Pittsburgh last week, it was decided not to close the factories during January. The matter was left in the hands of a committee, which is to investigate the situation in the glass trade.

The Standard Appliance Company, Franklin, Pa., has been incorporated with a capital stock of $250,000 to manufacture compressed air engine starters, air compressors, valves, gauges, etc. Q. D. Hastings is president; D. F. Domizi is vice-president and F. X. Schettler secretary and treasurer.

Safety and Sanitation Conference, New York

Industrial hygiene is to be discussed at a meeting scheduled for 10 a. m. Thursday, December 11, at Rumford Hall, Chemists' building, 50 East Forty-first street, New York, under the auspices of the American Museum of Safety. Dr. Thomas Darlington is announced to present the topic, "Sanitary Welfare of Workers," and others on the programme are: Dr. J. B. Hileman, medical examiner, Pennsylvania Railroad, "Physical Examination of Employees;" Frank A. Wallis, "Industrial Plants, their Equipment and Surroundings;" L. H. Brittain, National Electric Lamp Works, "The Feeding of Workers." Dr. W. Irving Clark, Norton Company, and William H. Gartley are among those invited to speak.

An afternoon session, from 2 to 4 p. m., is also to be given over to the subject, covering in particular occupational diseases; factory lighting, ventilation and dental hygiene. Two sessions are scheduled for Friday, the morning on "Employer and Employee" and the afternoon on "The Coming Generation," with Secretary of Labor Wilson, chairman.

Simultaneously with the meeting above mentioned there is being held at the Grand Central Palace, New York, what is known as the First International Exposition of Safety and Sanitation. As announced in an earlier issue, this exposition opens December 11 and is to close December 20, and promises to be highly interesting, widely informing and not without the beneficial influence for which it was instituted.

The H. W. Johns-Manville Company, Madison avenue and Forty-first street, New York City, has brought out the J-M Fyro fire extinguisher. It measures 3 x 15 in., and discharges by means of compressed air a liquefied gas said to be 40 times as efficacious as water in its extinguishing power. Its operation is quite simple. It is held in an upright position and a small valve wheel at the top is turned. It throws a spray as well as a stream, the spray going a distance of 10 ft. and the stream 25 ft. The gas forms a dense, combustion-arresting blanket which is five times as heavy as air. It can be used in electric fires without danger of short circuits.

The Graton & Knight Mfg. Company, belting, Worcester, Mass., has purchased and equipped a branch factory at Detroit, Mich. The company took over the plant and business of the Wayne Belting Company, located at 112 Second avenue, and transferred the equipment to 266 Jefferson avenue, East. In this factory will be manufactured the same standard line of leather belting and automobile specialties which the company has heretofore produced at Worcester for its Michigan trade. The new factory is in charge of C. F. Urquhart. All kinds of repair work will also be done at the Detroit plant.

The Bacher Iron & Steel Casting Company, Akron, Ohio, recently incorporated with a capital stock of $100,000, will manufacture malleable castings under a new process that includes treating the iron chemically, according to an announcement made by J. V. Price, Canton, Ohio, an officer of the company. The building of the Pioneer Pole & Shaft Company has been acquired by the Bacher Company and it is stated that three furnaces will shortly be installed in it.

The Asbestos Protected Metal Company, Beaver Falls, Pa., reports a trade of gratifying proportions with foreign countries. Recent export orders of asbestos protected metal have been shipped to the following countries: Chili, India, Japan, Java, Mexico, Peru, New South Wales, Panama, Philippine Islands, West Indies, South Africa, Tasmania and Australia. The export department of the company is in charge of W. J. Harris, 100 Broadway, New York.

The Steel Corporation Dissolution Suit

More Steel Buyers Testi y to Active Competition—A. W. Thompson a Witness

The attorneys for the defense in the anti-trust suit against the United States Steel Corporation continue to pile up testimony to prove that competition is free and active in the iron and steel markets. More than 100 witnesses have already been called in this connection and the general effect of all their testimony has been that as buyers, dealers, consumers and independent iron and steel manufacturers they have been able to purchase supplies according to price, quality, delivery, etc., without experiencing any difficulties such as restraint of trade.

How American Steel & Wire Treats a Competitor

At the hearing in New York City on Tuesday, December 2, Philander L. Carter, president Jackson Fence Company, Jackson, Mich., testified that his company manufactures wire fence under its own patents and sells it in competition with similar kinds of fencing made by other manufacturers, among them being the American Steel & Wire Company. While his company's orders for wire have been solicited actively by various wire manufacturers, Mr. Carter said that it has always made its purchases from the American Steel & Wire Company, despite the fact that from 1909 to 1911 prices named by the other wire manufacturers averaged $1 per ton lower. In explanation of this preference Mr. Carter said:

"We have appreciated the American Steel & Wire Company's ability to take care of us. The service it has given us has been exceptional. During rush times we have never been forced to shut down a day through lack of material, owing to the fact that the company always kept up on deliveries. The quality of its wire is improving year by year."

Mr. Carter further testified that the American Steel & Wire Company has never attempted to establish the price at which his company sells its fencing.

William H. Scobie, purchasing agent of the Philip Carey Mfg. Company, maker of roofing and other building materials, Wyoming, Ohio, a suburb of Cincinnati, testified that his company buys from two-thirds to three-fourths of its nail and wire requirements from the American Steel & Wire Company, placing contracts after bids have been received from various manufacturers. His experience proves substantial competition in the steel industry. He also testified that he found active competition in the sale of steel products when he was assistant purchasing agent of the Big Four Railroad prior to his connection with the Carey Company.

William O. Rogers, secretary-treasurer of the New York Metallic Bedstead Company, Jersey City, N. J., purchasing about 500 tons annually of steel angles, tubes, wire, etc., for his company, testified that all of this buying has been done on a basis of competitive bidding.

Emanuel Winelander, of Winelander & Jackson, makers of bedstead tubing, Brooklyn, N. Y., also testified there is active competition in the sale of the steel products which his company uses.

Interlocking Directors Do Not Dictate Policy

Lambert Hopkins, Chicago, purchasing agent of the Chicago, Burlington & Quincy Railroad, testified that he makes all purchases for that company and all are made on a competitive basis. Bids are asked and contracts are then let to the concerns quoting the best terms. He testified that George F. Baker and Norman B. Ream, directors of both his company and the Steel Corporation, have never interfered in purchases. He described how his company buys steel rails. The rail requirements, he said, are first discussed by him and H. H. Byram, vice-president in charge of operations. The specifications, distribution and other matters are considered, and the president then authorizes the quantity to be purchased. His testimony was continued on Wednesday, when the fact was brought out that although he buys as high as 50 per cent. of several steel products from the Steel Corporation he finds keen competition in the steel trade.

President Thompson of Inland Steel Testifies

On Wednesday a most important witness for the defense developed in A. W. Thompson, president Inland Steel Company, Chicago, and a former president of the Republic Iron & Steel Company. He was a member of the executive committee of the Republic Company for about five years, resigning from the company in 1905 when he went with the Inland Company, which since then has grown to be an important competitor of the Steel Corporation in certain products. He testified that the corporation could not destroy the independent steel companies now existing. In answer to a question on this subject, he said: "It is absurd to say that the Steel Corporation could go out and destroy the independent steel companies, even with its great power. That would be impossible."

Mr. Thompson stated that he had always believed in free and active competition in the trade and never observed any restraint exercised through such methods as price agreements. He admitted that he had attended practically all of the Gary dinners, saying: "I don't think I missed one of the Gary dinners. If I did I am sorry. I tried not to miss one, but there was never any agreement or understanding reached as to prices."

STEEL CORPORATION HAS SOME ADVANTAGE IN TRANSPORTATION OWNERSHIP

While Mr. Thompson asserted that the facilities of the Inland Steel Company for the marketing of steel products were practically the same as those of the nearby subsidiaries of the Steel Corporation, he admitted on cross-examination that the company did not own or control any transportation facilities for its ore supplies such as those possessed by the corporation, and this might be considered an advantage which the latter had over its competitors.

On the ore question, Mr. Thompson said that Lake Superior ores would continue to afford the principal basis for domestic supplies for a period of 35 to 45 years to come. He admitted that a great part of these ores are already in the hands of the Steel Corporation, but he asserted that there are billions of tons of low-grade ores in the district yet to be obtained. He expressed the opinion that the steel business of this country is not going to keep on doubling every 10 years as it has in the past. It is impossible for it to do so, and we shall have to have a slackening in new capacity.

H. H. Hammond, treasurer of the McMyler Interstate Company, fabricator of structural steel, Cleveland, Ohio, gave testimony regarding active competition in the steel business. His examination was continued on Thursday, when he stated that he had observed no indication of a combination to fix or maintain prices between the different steel manufacturers. From 1910 to the present time his company had bought 25 to 33 per cent. of its steel supply from the Carnegie Steel Company and had never paid either the Carnegie or Cambria Steel Company any premiums for prompt shipment.

A Double Hearing on Thursday

On Thursday a double hearing took place. Judge Dickinson for the Government and R. V. Lindabury for the corporation interrogated witnesses in one part of the building at 71 Broadway, New York, while Henry E. Colton for the Government and Mr. Severance for the corporation held forth with other witnesses in another.

Ferdinand E. Cutler, wholesale hardware, Waterloo, Ia., testified that his experience in purchasing wire nails has been that the price announced by the American Steel & Wire Company was generally accepted as the trade price, and that when "the price" of wire goods was understood to be the price of the American Steel & Wire Company, the latter's price was the price quoted in the trade papers as of "the leading interests." However, he generally found the prices given by the independents lower than those quoted by the American Steel & Wire Company.

William A. Lynn, Chicago, assistant purchasing agent for the Chicago, Milwaukee & St. Paul Railroad, testified that he always found free and active competition.

Col. William B. Melish, president of the Bromwell Brush & Wire Goods Company, Cincinnati, Ohio, testified that, although at times prices are the same, he has found quotations usually varied and competition was strong.

George E. Van Magen, vice-president of the Standard Forging Company, Chicago, testified that prices on axle billets, which his concern purchases extensively, varied from a minimum of 25 and 50c. per ton to as much as $7 per ton prior to 1907, but the widest variation since then was $4 a ton, which occurred in 1912.

The hearing was then adjourned until Monday, December 8, to permit the attorneys to go to Philadelphia to argue in the United States Circuit Court of Appeals the Government's motion to limit the defendant's time for putting in its evidence to December 23.

Court Will Not Limit Time of Defense

The motion by counsel for the Government to have the time limit for the presentation of the evidence of the defense fixed at December 23 was denied by the United States Circuit Court of Appeals at Philadelphia on Monday, December 8. Leave was given to the Government attorneys to renew the motion on February 20, 1914. The court decided that there was "no lack of diligence on either side." The hearings to date have occupied 127 consecutive days and the testimony covers over 17,000 typewritten pages.

The hearings were resumed before Special Examiner Brown, at 71 Broadway, New York, on Monday. Further testimony by buyers of steel products from Western districts, to the effect that quotations vary, prices fluctuate and competition is active, was given.

George H. Milne, second vice-president of the Simmons Mfg. Company, metal furniture manufacturer, Kenosha, Wis., testified that he purchases about 38,000 tons of steel products per annum, and has always found quotations to vary and "genuine competition" existing. On cross-examination, he admitted that practically all of his requirements were obtained from subsidiaries of the Steel Corporation.

Dr. William B. Phillips, director of the Bureau of Economic Geology for the University of Texas, testified that he estimates that there is about 200,000,000 tons of available ore deposits in Cherokee, Cass and Marion counties and approximately 500,000,000 tons of ore deposits in northeastern Texas. He admitted on cross-examination that thus far the Texas ores have not had any effect on the domestic steel industry, the supply being secured mainly from Lake Superior.

A. J. Bentley, secretary-treasurer of the Ohio Galvanizing & Mfg. Company, Niles, Ohio, testified that although he has found quotations constantly varying and competition active the prices of the American Sheet & Tin Plate Company are more steady. In depressed times in the last five years he received better prices from the independents than from Steel Corporation subsidiaries.

Walter Z. Hartman, president National Mfg. Company, Detroit, Mich., manufacturer and jobber of wooden and wire hoops and bale ties, said that all of the 5,000,000 hoops which his concern handles during a year are secured from the American Steel & Wire Company, despite the fact that the prices made by that subsidiary are a trifle higher than those of other makers.

Hans Hansen, Hastings, Neb., owner of ten lumber and coal yards throughout Nebraska, at all of which he sells woven wire fence, testified that there is plenty of competition in the wire fence trade in his State. He purchases supplies from various independents, but buys mostly from the American Steel & Wire Company.

The E. Keeler Company, Williamsport, Pa., is distributing a 20-page brochure, entitled "Boiler Facts," descriptive of the Keeler water-tube and return tubular boilers. This company is now in the forty-ninth year of its existence and the booklet outlines 12 good features of its boilers which have been thoroughly established by its long experience. The company states that it regards every boiler which goes from its shop as a pledge of good faith. This is the foundation on which its business has been built from small beginnings to one that reaches to all parts of the country. The largest power plants on the Isthmus of Panama, namely at Gatun and Miraflores, have 12 410-hp. Keeler water-tube boilers operating cableways for construction purposes.

The A. D. Granger Company, 90 West street, New York City, announces that it has recently been awarded contracts for a number of its Oswego internally fired water tube boilers, including two 125-hp. units for the new high school at Stamford, Conn.; two 75-hp. units for the new school at Cranford, N. J., and two 250-hp. units for the new Kaye Building, Madison avenue and Thirtieth street, New York City. The company is now prepared to build these boilers, where desired, to fill the Massachusetts law requirements.

Demonstration of Oxy-Acetylene Cutting Machines

A demonstration of oxy-acetylene steel cutting and welding apparatus was given to some 100 or 150 members and guests of the American Society of Mechanical Engineers, Thursday afternoon, December 4, at the plant of the Davis-Bournonville Company, Jersey City, N. J. The exhibit was arranged in a logical manner, beginning with a demonstration of the commercial methods of the production of oxygen, acetylene and hydrogen gases, and it included a number of demonstrations of the application of the oxy-acetylene and the oxy-hydric process of welding and cutting metals. In the welding room of the plant demonstrations were given of the hand welding of cast iron, steel, copper, brass and aluminum as applied to the repairing of boiler tubes, flue sheets, expansion joints, gears, machine parts, etc.

In the main shop a number of mechanical applications of the processes were shown. These included the Oxygraph, which in its original form was illustrated in *The Iron Age*, June 20, 1912. This machine makes use of the oxy-acetylene flame for cutting steel 1 to 4 in. in thickness to a desired pattern, the pantagraph principle being used. A recently developed type of Oxygraph, which is capable of using two cutting torches, instead of one, was also shown. This machine does not differ from the original one except in the capability to use two torches and also to handle much longer work, it being possible to cut pieces up to a maximum length of 15 ft. In a recent demonstration of this machine a cutting speed of 10 in. per min. was maintained in a 1-in. steel plate.

The machines included the radiagraph for cutting circular rings from a steel plate, the railograph, which is intended for cutting street railway rails as a substitute for sawing in the making of track repairs and replacements, and the holograph, which can be adjusted to bore holes from ½ to 2 in. in diameter in the webs of rails or structural steel members. While the railograph was designed primarily for street railway work, it can, by the substitution of different cams, be used for the cutting of structural steel or regular railroad rails. An automatic steel barrel welding machine, which employs two mechanically fed torches, one on the outside and one on the inside of the work, was also demonstrated.

The excursion concluded with the cutting of a section of steel armor plate, 12 x 16 in. by the oxy-hydric process in approximately 4 min. Another interesting feature was the demonstration of an emergency cutting outfit, in which an imitation section of a bank vault grating composed of 1-in. square steel bars was cut to permit the passage of a man in about 2 min. As its name implies, this outfit is designed especially for use in connection with the clearing away of steel wreckage where quick work is necessary.

The H. L. F. Trebert Engine Works, 495 St. Paul street, Rochester, N. Y., states that it will use its present plant entirely for building sample engines of different sizes, its intention being to license different concerns to manufacture its rotary engines on a royalty basis. It has already licensed one large concern, which agrees to turn out no less than 10,000 engines a year. The directors of the company are H. L. F. Trebert, L. G. Ogden and Martin Schragg. Mr. Trebert is a well-known designer of internal combustion engines.

L. A. Wilczek, 253 West 111th street, New York City, is now the general representative of the Zenzes Converter Company, builder of the Zenzes converter, which is used in several foundries in this country in the manufacture of steel castings. The claim is made that this is the only converter using up to 90 per cent. of scrap. It is stated in a recent descriptive circular, issued by the company, that about 50 installations have been made of this converter in Europe.

A large deposit of iron ore has been discovered in the New Hazelton district, about 40 miles from the town of Hazelton, B. C. It is stated that 10,000,000 tons have already been blocked out on the surface, and pits show a depth of 30 ft. The property is controlled by the North Pacific Mines Company, Prince Rupert, B. C.

The Extension of American Export Trade

President Farrell on the Methods Employed by Manufacturers—The Questions of Packing and Banking Facilities—Panama Canal Effects

At the annual meeting of the Illinois Manufacturers' Association at the Congress Hotel, Chicago, Wednesday evening, December 3, President James A. Farrell, of the United States Steel Corporation, spoke on the export trade of the United States, discussing several phases of the subject which have not been dealt with in his previous addresses. We present a number of extracts below:

Competitive Production and Selling

Much has been written and spoken concerning subsidies for steamship lines, American banks, governmental policies, consular efforts and trade reports, all of which are important collaterally, but of little avail unless our wares can be produced and sold in competition with the producers of other nations. England has a foreign trade per capita of $125, Germany $70, and the United States $40. To European countries, export trade is a matter of vital importance, and in view of the ever-changing economic conditions which are taking place in our country, it is evident that a large export trade is, of necessity, bound up with its future prosperity. The United States must take her place even to a larger extent than heretofore among the world's nations as a factor in international trade.

The advantage of immediate profit, or occasionally some loss in the sale of manufactured goods, should not be the controlling factor in the pioneer work in the earlier stages of development and organization. Establishing relations with customers, which result in continuity of trade and the ultimate placing of the business on a sound and profitable basis, is the essential element to be considered in building for the future, and it can be done with intelligent and far-seeing effort. Commerce is an exchange of one product for another. If we can make goods cheaper or better than our competitors, we will obtain the trade. If our goods cost more, or are inferior, we will make little progress.

Banking and Shipping Only Part of the Problem

There is a popular misconception that the paramount factors in the export trade of foreign countries are due to their financial ramifications and shipping facilities. But the striking annual increase of our country's trade with foreign nations reflects the results of adapting our products to the requirements of oversea markets; of painstaking effort and enterprise in competing with older manufacturing countries; of the knowledge our banking and manufacturing institutions are acquiring with respect to foreign opportunities; of the assistance that is being given by the Government and its consular representatives; of the increased efficiency of the productive establishments of this country and the capacity of their officials for organization and commercial development.

The difficulties in conducting an export business are not insuperable, but it is essential to adapt ourselves to foreign trade customs; their prevailing systems of weights and measures; selling at prices and in the currency to which the buyer is accustomed; furnishing the goods that the buyers require, or educating them to a superior quality; packing and shipping in accordance with their instructions, to meet the special requirements of transportation, even though it involves radical departure from our customary methods.

The American manufacturer will continue to concentrate his efforts on process, cost of production, and adaptability of manufacturing to the requirements of the markets, as well as to the offering of wares of peculiarly American origin and ingenuity. By their use of special machinery, their extraordinary facility of invention, experiment and improvements, American manufacturers are participating to a larger extent in the area of expansion in foreign commerce.

Our Steel Exports Misrepresented

The fact that exports for the last fiscal year exceeded by $258,000,000 the value of exports for the preceding year would seem to contradict the statement of those who would belittle the position of American manufacturers in obtaining footholds in markets where the older manufacturing nations have been well entrenched for decades. For example, it has been stated that the exports of crude steel and iron products from the United States increased only from 1,154,000 to 1,533,000 tons or 33 per cent., from 1901 to 1910; while Great Britain's had increased 43 per cent. and Germany's 480 per cent.; also that America was steadily losing prestige in the world's steel market. As a matter of fact, Germany's exports during the period mentioned increased 215 per cent., instead of 480 per cent., while the export tonnage classes of iron and steel from the United States has increased from 326,590 tons in 1903 to 2,947,596 tons in 1912, an increase of 900 per cent.

The total value of exports of iron and steel increased from $99,000,000 in 1903 to $304,000,000 in 1912. The year 1903 is selected for comparison for the reason that it was only in 1904 that American iron and steel manufacturers commenced a systematic and concentrated development of foreign trade, efforts prior to that period having been of a sporadic character, contingent largely upon the existence or absence of sufficient domestic demand.

Comparisons that have been made with the exports of iron and steel for 1910 from the United States with the year 1900 are misleading, the latter being a year when export business was artificially stimulated by the acute necessity of American manufacturers for export business, and large quantities of both finished and semi-finished materials were sold in foreign markets at prices which, generally speaking, were unremunerative. The 326,000 tons exported in 1903 were valued at $20,452,000, whereas the 1,154,000 tons exported in 1900, i. e., over three times the quantity, were but twice the value, i. e., $42,518,000.

The exports of steel products increased from approximately 291,000 tons in 1901, the year of the formation of the United States Steel Corporation, to 2,280,778 tons in 1912—an increase of approximately 1000 per cent. This is mentioned since it has been claimed by some that there is an inaptitude on the part of large corporations in the direction of efficiency and in the increasing of exports. The result referred to is a concrete illustration of the possibilities of developing foreign business through integrated organization.

Export Prices and Home Prices

While it has been generally conceded that export business is desirable and necessary to supplement domestic trade, some economists have insisted that such business should not be accepted at less than the domestic prices. No explanation, however, is offered as to the method of obtaining export business except at prices competitive with those of foreign manufacturers. It is unnecessary to argue with any one who has a knowledge of the world's export trade that American materials cannot be sold in foreign markets at other than competitive prices for like quality.

Despite initial preference for well-known foreign goods; the long-established brands, types, styles or kinds of foreign materials; despite close affiliations of foreign manufacturers antagonistic to new competitors in the field; despite foreign investments inducing preference for materials of the countries supplying the money; despite more extensive steamship facilities to the outports of the world to which our trade is not yet sufficient to obtain similar facilities; despite preferential duties accorded generally by the colonies of European countries to their mother countries; and despite lower costs of production, due to lower wage scales, American manufacturers have achieved noteworthy results in the upbuilding of their foreign trade.

Government Help at Home and Abroad

The expansion of export trade on the part of European countries has largely been due to the co-operation between the various commercial organizations for the promotion of

trade relations with individual countries, the development of commercial organizations in Germany has done much to mold the economic position of that country. Over 600 national commercial organizations, with 5000 auxiliary branches, indicate the scope and activity which such a multiplicity of ramifications bear to the results obtained by concentrated effort. In the export field, three of the parent organizations, with a membership of over 30,000 firms, exert their combined influence in fostering the export trade of Germany. What is true of Germany in this respect is also true of England, France, Belgium, Austria-Hungary and other European nations.

There is a wide-spread belief in this country that Germany owes her position in exports to governmental aid. This is only partly the case. It is the co-operation between the government and her commercial organizations that counts in furthering the interests of the German Empire in the world's markets.

The Department of Commerce at Washington, through the Bureau of Corporations, purposes to undertake a study of the question of the economical efficiency of the large business organizations of the country, to ascertain among other things to what extent their facilities have enabled them to make scientific inquiry into refined methods not possible to small business.

In this study it will no doubt be found that the large companies are taking advantage of every opportunity to reduce costs of manufacture without reducing wages, and are improving their plants and processes to an extent enabling them to compete in the markets of the world, and maintain their position as exporters on a large scale, promoting the commercial interests of the United States in foreign countries through the influence of their large shipments, and through extension of the knowledge and experience with American manufactured products throughout the world; and by creating an exchange of values which is reflected in a favorable balance of trade involving hundreds of millions of dollars.

Questions of Shipping and Packing

With respect to the question of shipping, trade follows the freight rate, and it must be apparent that without shipping facilities and reasonable freight rates to most markets, we could not have obtained the not inconsiderable position which this country at present occupies in foreign markets. When these facilities have been insufficient, or the freight rates exorbitant, it has usually happened that there have been found those who are sufficiently venturesome to establish new and competing steamship lines, to charter steamers, and otherwise encourage the movement of freight to any quarter of the globe.

We have been told for many years that careless packing and inattention to buyers' requirements (stock arguments of those who have made a casual study of foreign markets), are militating against American success. It needs only reference to the statistics of the increase of our export trade during recent years, to refute the idea that seems to be prevailing that American manufacturers are lacking in sense, carefulness, and ability in these matters, whatever may have been the record in occasional cases years ago.

Those who are interested in pursuing this subject, might well devote some attention to the appraisers' stores at any of our American ports where foreign goods are received, and observe the condition of their packing, and then make comparison with statements regarding the condition in which American goods arrive in foreign ports. Exporters in all countries know the necessity of following instructions, and where unusual packing is required the difference in cost is added to the price of the goods.

The Panama Canal

Further reflection on the subject of the possibility of export trade naturally leads to consideration of the effect of the Panama Canal. Opening the water-way through the Isthmus will shorten the distance from New York to San Francisco from 13,397 miles by way of Cape Horn to 5208 miles, with a corresponding diminution in time and cost of the voyage.

The effect on the commerce of the world will be important, and much study has already been given to the changes consequent upon the shortening of the voyages of steamers to a large number of ports. One result not frequently mentioned is that, unless there is a remarkable increase in the consumption of materials throughout the countries reached by way of the canal, there must be, at least for a period, a readjustment in the number of vessels required, comparable to the lessened duration of the voyages. Whether this will mean an increased supply of steamers available to shippers, and a consequent reduction in freight rates cannot be safely predicted, as it must depend upon the volume of commerce after the canal is opened, but it must not be overlooked that, while the length of the voyage from American ports to the west coast of South America, Australia, China, Japan, etc., and the Pacific Coast of the United States, will be materially lessened, there will be an equivalent lessening of time in most cases from foreign ports to the same destinations.

The arteries of ocean commerce will undergo an important change, and American manufacturers should study closely the questions of facilities through the lessened time of communication to the west coast of South America and other markets, as affecting the exports of their particular products. It should be borne in mind that trade has to grow, and while the operating of the canal will facilitate shipping, it will not of itself create at the outset new trade which must grow with the increase of population and its needs. Optimism concerning its facilities will arouse greater economic efforts on the part of countries adjacent to it.

Credits and Banking

A delusion has existed that the trade of the United States with foreign countries is carried on within narrow limits; that we will not extend credits, and, in consequence, a large volume of trade goes to Europe which would come here, were we to grant credits of six to nine months. In the great majority of cases, such credits are granted against acceptance of drafts with interest added for the accommodation, but probably the bulk of business of the best buyers is done against bank credits or cash against shipping documents. Where there is a substantial basis for credit, American manufacturers will not be found lacking in devising means to grant reasonable and proper accommodation. It will be invariably found that where extended credits are given the seller charges an increased price, and buyers do not benefit to the extent which reasonably prompt payment entitles them to.

American manufacturers have been criticised for indifference to the need of credit on the part of their foreign customers, and their alleged lack of liberality contrasted with the more accommodating attitude of their European competitors. There is no indiscriminate granting of long credits to foreign buyers on the part of British, German, or other foreign exporters, and an experience extending over many years in competition with the world's producers has failed to show that they are more willing or better prepared to grant long terms of credit to oversea buyers than American manufacturers.

With regard to banking facilities, our manufacturers experience no difficulty in selling their drafts against shipments to any quarter of the globe. American bankers appear ready and willing to perform this service for as small a commission as foreign bankers. Banks are institutions that follow trade, and eventually American bankers will establish American banks abroad, just as European banks have established branches, not for the mere purpose of buying and selling drafts, but for the purpose largely of participating in the development of the country in which they locate. The early history of German banks in Latin America and the Far East was one of continued failure. It was only after they had solved the problem of doing a banking business in the country where they were established, rather than merely acting as mediators of German trade, and began to finance industrial enterprises, railway construction, etc., in the land of their adoption, that they commenced to do a large business.

Speaking to men interested in manufactures and exports, it might be said that, as long as we have adequate facilities for discounting our drafts and elasticity in the acceptance of sound commercial paper, we may safely leave to the bankers the creation of the American banks abroad, when they consider the time has arrived to establish banks for the transaction of American business in foreign countries.

The Machinery Markets

The quiet conditions of the past few weeks have merged into the usual dullness which comes with the mid-winter holiday season. The lack of active buying covers the entire country and nowhere is much betterment expected until after January 1. In New York occasional sales show that there is still imperative need of new machinery in some industrial plants. Buyers continue to hold off in New England, but a good symptom is a better tone in the money market. Business in Philadelphia has consisted almost entirely of the closing of old propositions and improvement is not expected to come until February 1. Cleveland has felt a somewhat better demand for single machine tools, but the market continues dull and probably will be so for the remainder of this month. Considering the approach of the holidays business has not been altogether unsatisfactory in Cincinnati and 1914 looks promising, providing the railroads get their rate increase. Standard machine tools are dull in Detroit with the market for special equipment somewhat broader, but no immediate betterment is expected. Chicago dealers have received some excellent orders for manual training schools in that city; otherwise quiet has prevailed. Tight credit conditions are held responsible for the slowing up of production in Milwaukee. In the Central South buying is being deferred and the boiler makers who were complaining of low prices are now complaining of fewer orders. Both sales and inquiries are fewer in St. Louis, but collections are good and some lines are busier than in other territories. In the Pacific Northwest trade is light, but better than at this time a year ago and the prospect for mining machinery is good. New inquiries are almost lacking in the San Francisco territory and little betterment is expected this year, though merchants are hopeful for an improved business in 1914.

New York

NEW YORK, December 10, 1913.

The quiet of the last few weeks is unaltered, with the season at hand when dullness is considered normal. Consequently no improvement is expected until after the first of the year, at least. In all the discussions as to the various contributing causes of the recent dullness the currency question, which is held accountable for a scarcity of money, is given first place. To offset this phase of the situation so far as possible a few large machine tool manufacturers have offered to extend time of payments. Some fairly good inquiries continue to be received by some sellers, but closing them is another story. Several inquiries for equipment, including some crane business, has been deferred to the indefinite future. Eventually, these requirements must result in an excellent quantity of orders. To sales now being made there usually is some interesting side-light, which generally shows that actual need of new machinery still exists. In one case where a manufacturer bought a machine he admonished the seller to make a quick delivery for the reason, as he said, that he needed the machine badly or he would not be purchasing at this time. In another instance where the buyer wanted a milling machine whose maker had been running behind in filling orders, he specified February delivery, supposing that a quicker one could not be made. It happened that the house making the sale had a machine in Chicago whereon the buyer said he would take it as soon as the machine could be shipped East. What business there is at present is entirely from industrial companies, the railroads not figuring at all.

The Hughes Specialty Well Drilling Company, 96 Ashley avenue, Charleston, S. C., is in the market for stamping or rolling cutting machines for cutting out segments of asbestos banding 3 in. wide. Other measurements and particulars will be furnished upon application to the company, which is also in the market for two spindle drill presses.

The Turner Construction Company, 11 Broadway, New York, has been awarded the contract for the wholesale grocery warehouse and factory to be built by Havemeyer & Elder and leased to Austin, Nichols & Co. The building is to be 179 x 440 ft., six stories and basement, of reinforced concrete. It will cost about $1,000,000. The building will be equipped with every modern device for the rapid loading and unloading of ships and trains, including spiral chutes, overhead conveyors and pneumatic tubes, besides elevators and lowerators.

The Arthur VanNess Company, 11 Clinton street, Newark, N. J., is erecting a new factory and storage building on South Twentieth street, Newark. Only a small portion of it will be devoted to manufacturing.

Hull, Grummond & Co., Binghamton, N. Y., will build an addition to their five-story and basement factory on Water street.

Mayor Sheehan, president of the board of public works, Elmira, N. Y., is having plans and surveys prepared by F. H. Shaw, engineer, Lancaster, Pa., for a pumping station and sewage disposal plant to be erected by the city.

The Spring Valley Chemical & Mfg. Company, Utica, N. Y., is building additions to its plant which will be 140 x 160 ft. and 50 x 150 ft.

The Tonawanda Board & Paper Company, Tonawanda, N. Y., is building an addition to its plant which will be used to increase its beater room facilities. The cost of the improvements will be about $25,000.

The Buffalo Steam Pump Company, North Tonawanda, N. Y., has let the contract for an addition to its plant to cost $20,000.

The Eastern Wax Paper Company, Inc., Rochester, N. Y., has been incorporated with a capital stock of $50,000 and will equip a plant for the manufacture of waxed paper and other paraffine products by R. J. Hicks, 567 Plymouth avenue, B. W. German and C. E. Collier.

A two-story building, 63 x 164 ft., is to be added to the plant of the Utica & Mohawk Valley Cotton Mills at Utica, N. Y.

The New Process Gear Company, Syracuse, N. Y., has let the contract for a case-hardening building.

The Phillips & Clark Stove Company, Geneva, N. Y., has commenced work on the erection of an addition to its factory, 60 x 100 ft., four stories and basement.

The H. L. F. Trebert Rotary Motor Company, Inc., Rochester, has been incorporated with a capital stock of $150,000 and will engage in the manufacture of machinery. H. L. F. Trebert and M. J. Schrag, Rochester, and L. G. Ogden, Penn Yan, N. Y., are the incorporators.

W. L. Stoddart, architect, 30 West Thirty-eighth street, New York City, has completed plans and is ready for bids for a three-story factory building, 50 x 200 ft., with a one-story wing, 50 x 130 ft., to be erected at Schenectady, N. Y., by the Mica Insulator Company, 68 Church street, New York City.

The Meyer Motor Company, Buffalo, recently incorporated with a capital stock of $50,000 by Arthur W. and Clayton H. Meyer and Franklin D. L. Stowe is arranging for a plant at 1019 Main street.

New England

BOSTON, MASS., December 9, 1913.

Machinery builders and dealers report a continuation of the dullness which has prevailed for some weeks. Manufacturers of metal products acknowledge frankly that they are holding off in their buying, to the extreme limit, but not a few of them add that this attitude is based not so much upon a belief that 1914 will be a lean year, as upon the conviction that they will be able to buy later on more favorable terms. They point out that hundreds of others are deferring the placing of orders for the same reason, and that the buying movement, as a consequence, must begin early in 1914, and should reach proportions that cannot help but exert a strong influence for the better. In this connection it is argued that once the tide turns the tendency will be upward for some time. Bankers are more cheerful than they were a few weeks ago; they expect to see good results follow an easier money market.

Much interest is taken in the future of the Pope Mfg. Company, Hartford, Conn. The proceedings in the

Connecticut and Massachusetts courts indicate that orders are being booked in good volume at the Hartford works for automobiles, and at the Westfield, Mass., factory for bicycles and motorcycles, in spite of the fact that the business is being operated by a receiver. The present litigation has to do only with the personnel of the receivership, the chief cause of difference being that the company's works are located in both Connecticut and Massachusetts. It is strongly hoped that the final result will be a reorganization, with ample capital with which to carry on the industry along the lines of economical production.

The textile machinery industry is very good for the season. For several years, up to a few months ago, it was hit pretty hard, with intermittent periods of prosperity. Since that time it has not by any means been pushed to capacity, excepting for silk machinery, but business as a whole has been moderately prosperous.

The Navy Department will complete in Government yards two submarines which are practically ready for delivery at the plant of the Lake Submarine Boat Company, Bridgeport, Conn., having accepted the company's offer to surrender the contract. However, the department will give the company reasonable additional time for the building of three other submarines, work on which is in the earlier stages, pending a contemplated financial reorganization of the business.

The plant of the American Shoe Finding Company, Bingham, Me., was burned December 1, with a loss of $100,000, much of it on machinery. The power plant was included in the destruction.

The casting shop which the American Brass Company will build at Torrington, Conn., as an addition to the Coe Brass Company plant, will eventually be 350 x 500 ft., according to the plans. However, probably only a part of the structure will be erected in the beginning, and when that will be will depend upon business conditions.

The Rice, Barton & Fales Machine & Iron Company, Worcester, Mass., manufacturer of paper machinery, has awarded the contract for an additional machine shop building, 40 x 100 ft., one story, designed so that it can be extended in the future as increased space is needed. The company has contracted for such additional equipment as may be required.

The South Norwalk Engineering Company, South Norwalk, Conn., is to erect works at Stratford in the suburbs of Bridgeport, Conn.

The Brookside Paper Company, South Manchester, Conn., will build a complete new plant in the spring on land recently purchased.

Philadelphia

PHILADELPHIA, PA., December 8, 1913.

The first week in December was probably duller than previous weeks. New business is extremely light and the few contracts closed were mostly on old propositions which have been under negotiation for some time. Orders are occasionally taken for small groups of tools but the bulk of the business is in single tools. Very little railroad buying is reported, although the Pennsylvania Railroad came into the market for a large gap lathe for New York delivery. Little new business is expected until after the turn of the year; some sellers do not look for much demand until after February 1. Second-hand machinery is dull and boilers and engines are quieter. Business in steel castings is dull and the demand for gray-iron castings is gradually becoming lighter.

Bids are being received for a two-story brick and concrete machine shop, 60 x 114 ft., to be erected at Twenty-sixth and Christian streets for the Philadelphia Electric Company from plans by John T. Windrim.

The Breakwater Company, Morris Building, is preparing to have plans drawn for a new machine shop to replace the one recently destroyed by fire at Bellevue, Del.

The Stone Harbor Ice & Bottling Company is reported to be taking bids on the construction of a one-story refrigerating plant to be erected at Stone Harbor, N. J.

Local contractors are estimating on a two-story brick and steel foundry building to be erected for the Sanitary Company of America at Linfield, Pa. The building will be 238 x 262 ft., of fireproof construction.

A permit has been issued for the erection of a two-story workshop, 25 x 100 ft., for the Majestic Laundry Company, 3728 Haverford avenue, from private plans. The addition will cost about $6000.

The American Railway Company, Witherspoon Building, is reported to be taking bids for the erection of car barns, shops and a power house near Springfield, Ohio. Plans are by W. R. Keen, engineer, Witherspoon Building.

Announcement is made of the incorporation of the Pennsylvania Grinding Wheel Company of this city with a capital stock of $50,000 for the manufacture of grinding and polishing wheels and stones and machinery for grinding and polishing. The incorporators are Samuel S. Sadtler, Stenton avenue, Springfield Township, Montgomery County, Pa.; S. B. Smith, Merchantville, N. J., and H. L. Hacketa, Philadelphia, Pa.

It is stated that Richard A. Kerns, Jr., engineer, Coatesville, Pa., has practically completed plans for two two-story steel and concrete factory buildings to be erected for the Rowe Motor Mfg. Company, Downington, Pa. Both buildings will be 65 x 145 ft. Bids will be asked in about a month.

The Birdsboro Steel Foundry & Machine Company, Birdsboro, Pa., reports a very fair volume of business. Conditions improved in November. The plant is being operated at about 90 per cent. capacity and promises to so continue for several months. No large improvements have recently been made by this company, although a few new tools have recently been added to its equipment.

The Salem Glass Company, Salem, N. J., will have plans drawn for rebuilding the portion of the plant recently destroyed by fire and expects to take bids for the work in about two months.

Chicago

CHICAGO, ILL., December 8, 1913.

The distribution of orders covering the requirements of the Chicago Board of Education resulted in the placing of 85 engine lathes with three Chicago machinery houses in lots of 35, 30 and 20. Aside from this business the market has continued quiet with little new business appearing, particularly from the railroad interests. For such individual inquiries as emanate from general industrial sources, quotations indicate the keenness of competition and shading of prices is not entirely absent.

A. H. Anderson, 1215 Fulton street, Chicago, is having plans prepared for a one and two-story brass foundry, 25 x 120 ft., estimated to cost $6000.

The Robbins Mfg. Company, planing mill operator, Chicago, will erect a two-story brick factory, 50 x 126 ft., at 1811 North Central Park avenue, at a cost of $20,000.

The Triple S Machine Company, 1013 Wellington street, Chicago, is in the market for a punch press, experimental lathe and other small tools and dies.

The Barrett Mfg. Company, 2900 South Sacramento avenue, Chicago, is in the market for a second-hand 150 to 250-hp. locomotive type boiler good for 100 to 125 lb. pressure.

The P. A. Starck Piano Company, 208 South Wabash avenue, Chicago, has leased from the trustees of the central manufacturing district a site 230 x 280 ft., on which the trustees are to erect a four-story building of heavy mill construction with a total area of 125,000 sq. ft. Plans are being prepared by S. Scott Joy, architect.

A. L. Levy, architect, 10 South La Salle street, Chicago, has completed plans for a one-story garage to be erected on Ogden avenue for A. Bartelstein at a cost of $10,000.

B. Kuppenheimer & Co., Chicago, are erecting a factory building on West Twenty-second street, at a cost approximating $150,000. S. N. Crowen is the architect.

The Betschel Storage Battery Company, Chicago, has been incorporated with a capital stock of $31,000 to manufacture and sell electric batteries by R. A. Risch, George M. Merker and H. L. Wuerffel, Maywood, Ill.

The Excella Vacuum Machine Company, Chicago, has been organized by Joseph H. Muhlke, Austin H. Hart and James Turnock with a capital stock of $25,000 to manufacture and sell vacuum machines.

The Motor Devices Company, Chicago, has been incorporated with a capital stock of $3000 to manufacture and sell automobile accessories, etc., by George M. Shontz, 4230 North Winchester avenue, George A. Kelly and Rupert D. Donavan.

The Ingersoll Electric Vaporizer Company, Chicago, has been incorporated by Homer H. Ingersoll, Theobold and Daniel Mueller with a capital stock of $15,000 to manufacture machinery, tools, devices, etc.

Frank Gahm, Streator, Ill., is erecting a factory building, 50 x 100 ft., of fireproof construction.

Mechanical and Civil Engineers,
PITTSBURGH, PA.

The city of Oregon, Ill., has voted a $7000 issue of bonds for a new power plant.

The Malleable Iron Works, Galesburg, Ill., whose plant was burned several months ago, has started to rebuild.

The American Standard Tool Company, Joliet, Ill., recently incorporated, is equipping a plant for the manufacture of wrenches and other patented tool specialties.

L. L. Graves, Streator, Ill., manufacturer of gray-iron castings, plans to erect a fireproof foundry, 50 x 100 ft.

Winchester, Ill., has voted a bond issue for the construction of municipal waterworks.

The mill at Decatur, Ill., owned by the American Hominy Company, was burned during the week with a loss of $100,000. It will be rebuilt, it is stated.

The Atlantic Canning Company, Atlantic, Iowa, suffered by fire on November 27, the damage to machinery and buildings being estimated at $150,000.

The Headford Bros. & Hitchins Foundry Company, Waterloo, Iowa, has increased its capital stock from $25,000 to $75,000.

The waterworks plant at Perry, Iowa, is to be rebuilt at a cost of $50,000.

C. U. Scott, Davenport, Iowa, has ordered a modern galvanizing plant from the Meaker Company, Chicago.

Bids will be received until December 17, by H. G. Huckstadt, mayor, Westmoreland, Kan., for a deep well pump, oil engine, etc.

Bids will be received by G. G. Bruckert, village clerk, Bruning, Neb., until January 15, for waterworks and a lighting plant.

The Universal Patent Mfg. Company, Denver, Colo., organized and financed by the Denver Mortgage & Investment Company, will build a factory for the manufacture of small patented articles.

The city of Roundup, Mont., recently voted to purchase the private waterworks system. Improvements will be made at once. Address the city clerk.

Milwaukee

MILWAUKEE, WIS., December 8, 1913.

Industrial development is hampered by tight credit conditions. Loan rates are considerably higher than usual and only the best class of paper is accepted, with the result that some important extension work, as well as new construction, is delayed. Established firms are buying sparingly and only for the most immediate needs. Municipal purchases for water and electric power purposes forms a considerable part of the rather small volume of orders. Production is gradually being reduced but employers express the conviction that re-employment will follow immediately after January 1.

The Joseph Schlitz Brewing Company, Milwaukee, has plans for a private garage building and repair shop in connection with its brewing and malting plant, to cost $35,000. It will be 110 x 150 ft. A considerable list of special tools will be required. The company will replace all horse-drawn equipment with motor-propelled vehicles. Joseph E. Uihlein is general manager.

The Sterling Machinery Company, La Crosse, Wis., has purchased a 150-ft. lot at 118 South Second street and will remodel the buildings there into a machine shop for the production of concrete mixers, brick and block machinery and contractors' supplies. In the spring the company plans to build a modern structure to take in the present factory.

The Pine-Ihrig Machine Company, Oshkosh, Wis., manufacturer of wire-link fabric machines, has leased the Choate factory south of its present quarters and will take occupancy as soon as remodeling work is completed and equipment installed. About 90 per cent. of the company's product is sold in foreign countries. The new quarters will make possible a considerable increase in the annual output.

The Green Bay Foundry & Machine Works, Green Bay, Wis., has been incorporated with a capital stock of $30,000 by H. L. Indra, H. J. Arvey and I. E. P. Miller, who have had practical experience.

A garage and machine shop will be established at Ripon, Wis., on February 1 by A. M. Harger, who has leased a building which he is now remodeling.

The city of Hartford, Wis., is contemplating the installation of an additional steam engine and electrical generating apparatus in the municipal light and power plant. The present equipment consists entirely of Allis-Chalmers engines and generators.

The city of Altoona, Wis., is working on plans for the establishment of a municipal waterworks system, the work to be done early next year.

The Laursen Automatic Pump Company, Eau Claire, Wis., is receiving excellent orders and is rushing work on its new assembling and erecting shop. The company is about to close contracts for pumps with several municipalities in Oregon and Idaho, one requiring an elevation of 825 ft. Contracts have also been booked from several Wisconsin municipalities, among them Wauzeka, Bayfield and Draper.

Detroit

DETROIT, MICH., December 8, 1913.

Business in the standard lines of machine tools continues dull, sales being confined to single tools and the buying seemingly of a hand-to-mouth order. Inquiries are light and scattering with no indication of improved business. In some lines of special equipment the market is broader, but even here conservatism is strongly in evidence. Advices from a number of firms in the tool building trade are to the effect that not much new business is in prospect and that the next two or three months will be lean ones. Very few of the automobile plants are running anywhere near to capacity and the same is generally true of the accessory and parts makers. The second-hand machinery market is not active. A decreased demand for castings is noted by both steel and gray-iron plants. New work in building lines is plentiful, but the propositions are mainly of a minor character.

The Michigan Bedding Company, Detroit, has taken out a building permit covering the erection of a three-story brick factory, 48 x 80 ft., to cost $7500.

The Barton Auto Top Company, Detroit, has been incorporated with $10,000 capital stock to manufacture automobile tops. Albert Barton is the principal stockholder.

H. T. McClune and John B. Schmandt, Detroit, have established a foundry at 835 Superior Street under the name of the New Brass Works. The new company will specialize in brass and aluminum automobile accessories.

The coal tipple of the Handy Bros. Monitor Mine, near Bay City, Mich., was destroyed by fire December 5 with a loss of $10,000. It will be rebuilt at once.

The Wolverine Brass Works, Grand Rapids, Mich., has filed notice of an increase of capital stock from $500,000 to $700,000. The additional capital will be used to take care of increasing business. The company has erected a large new factory this year and reports a good demand for its lines of plumbers' supplies.

W. D. Young, Bay City, Mich., will erect a large woodworking plant at Bay City for the manufacture of interior finish. The building will be one story, 115 x 400 ft., and will be equipped largely with special machinery.

The Moench Sons Company, Alpena, Mich., will remove its business to Gowanda, N. Y., where a new plant will be erected.

The General Screw Products Company, Detroit, has been incorporated with $1000 capital stock to manufacture screw machine products. Featley Green, Charles R. Talbot and Montgomery Wiaing are the incorporators.

The Glue Specialties Company, Detroit, has filed articles of incorporation giving its capital stock as $130,000 and will manufacture adhesives and starch. Lowell R. Burch, John H. Winterbotham and Prescott Dudley are named as incorporators.

The Bay View Furniture Company, Holland, Mich., has begun work on an addition to its factory, 32 x 40 ft., three stories, to be used as a glue room.

The American Paper Box Company, Grand Rapids, Mich., will erect a new building for the manufacture of paper boxes, adjoining its paper mills. The new factory will be modernly equipped.

The Hot Blast Feather Company, Grand Rapids, Mich., has acquired a large five-story factory building and will install considerable additional equipment. George C. Hollister is secretary.

The H. H. Fox Company, Lansing, Mich., has been incorporated with $10,000 capital stock to manufacture sheet metal work. H. F. and A. W. Fox are the principal stockholders.

The Dudley Tool Company, Menominee, Mich., is preparing to expand its facilities to permit it to engage in the manufacture of cycle cars.

The Henry Rowe Mfg. Company, Newaygo, Mich., manufacturer of wood turnings, has broken ground for the erection of a new plant.

The D'Arcy Spring Company, Kalamazoo, Mich.,

has let the contract for an addition to its plant, 30 x 90 ft., one story, at a cost of $10,000.

The Lyons Handle & Furniture Company, Lyons, Mich., has been incorporated with $10,000 capital stock to manufacture tool handles and furniture specialties. A factory has been secured and a new power house will be erected. P. H. Powell is general manager.

Indianapolis

INDIANAPOLIS, IND., December 8, 1913.

The Motor Car Mfg. Company, of this city, has increased its capital stock $100,000.

The Veedersburg Brick Company, Indianapolis, has been incorporated with $50,000 capital stock to manufacture brick and tile. C. A. Pritchard, F. B. Adams and C. B. Marshall are the directors.

The Bahr Bros. Mfg. Company, Marion, Ind., whose product has heretofore been manufactured at the foundry of the Marion Malleable Iron Works, is equipping a new plant to be in operation January 1.

The plant of the American Car & Foundry Company, Jeffersonville, Ind., has been working overtime on a rush order for baggage and express cars for the Chicago & Northwestern Railway. There are other orders on hand to keep the plant at capacity for seven or eight months, the largest being for 75 all-steel passenger coaches for the New York Central Lines.

James B. Hardgrave, representing the Insull interests, Chicago, has bought the water, electric and gas plants at Aurora, Ind., for $185,000. The plants will be modernized.

The Ft. Wayne Auto Supply Company, Ft. Wayne, Ind., has been incorporated with $50,000 capital stock to manufacture automobiles and accessories. The directors are J. M. Carmer, J. A. Brewer and H. H. Criswell.

The Coliseum Garage & Machine Company, South Bend, Ind., has been incorporated with $10,000 capital stock. The directors are John Walz, W. P. Furey and J. E. Peak.

The Robinson Machine Company, North Vernon, Ind., has been incorporated with $3000 capital stock, to manufacture automobile accessories. Thomas A. Robinson, Martin W. Brogan and I. M. Brogan are the directors.

The Butler Arts & Crafts Company, Plainfield, Ind., has been incorporated with $50,000 capital stock, to manufacture furniture. G. F. Butler, R. F. Davidson and P. G. Henderson are the directors.

The Anderson Sheet Metal Company, Anderson, Ind., has been incorporated with $5000 capital stock to manufacture sheet metal articles. Frank Strough, Edward Hoover and Edwin Clawson are the directors.

The Hoosier Paper & Envelope Company, Michigan City, Ind., has been incorporated with $200,000 capital stock to manufacture paper. M. A. Cushman, C. N. Atkinson and H. L. Crumpacker are the directors.

Goodland, Ind., has voted in favor of a municipal waterworks plant. Estimates of the cost are being made.

The Ross Motors Company, Muncie, Ind., has been incorporated with $25,000 capital stock to manufacture automobiles and accessories. H. V. Hancock, V. H. Hancock and E. T. Ross are the directors.

The Hammond Knitting Company, Hammond, Ind., has increased its capital stock $15,000.

The National Gate Company, Rushville, Ind., has been incorporated with $32,000 capital stock to manufacture gates. J. S. Davis, A. M. McGinnis and S. O'Neal are the directors.

Cleveland

CLEVELAND, OHIO, December 8, 1913.

The demand for single tools has been somewhat more active during the past few days, but the market is dull and dealers do not look for any material improvement in December. The largest buying reported was from the Transue-Williams Company, Alliance, Ohio, for presses, hammers and a few machine tools for extensions to its forge shop. While there has been a general slowing down in production by most metal-working plants a few are still running at full capacity. Little new factory building work is going on in this city and vicinity, so that practically no demand is reported from new buyers. Conditions in the foundry trade continue dull. Steel foundries have been fairly busy up to the present time, but now have few orders ahead.

The Parish & Bingham Company, Cleveland, maker of sheet steel stampings, has increased its capital stock from $244,000 to $1,000,000.

The Regar Brass Mfg. Company, Cleveland, has increased its capital stock from $40,000 to $100,000.

The Burke Valve Company, which has maintained an office in the Arcade, Cleveland, has established a plant for the manufacture of valves in the building on Windsor avenue formerly occupied by the Raymond Piano Company.

The American Fire Clay Company, Cleveland, has increased its capital stock from $250,000 to $400,000. The new capital will be used in erecting a paving brick plant and later a factory for making fire proofing. Its plant is located in Loveland, Ohio. B. T. Day is president and H. J. Baldwin is secretary and treasurer.

The Federal Improvement Company will build a two-story brick warehouse at 6215 Carnegie avenue, Cleveland, which will be occupied by the Western Electric Company for distributing its products.

The F. Zimmerman Company, Cleveland, maker of molding, will erect a new plant. It will be a brick structure, two stories, 122 x 322 ft. The company will also erect a power plant.

Cincinnati

CINCINNATI, OHIO, December 8, 1913.

Considering the nearness of the holiday season, business with local manufacturers, in all lines, is not altogether unsatisfactory. A number of firms, now busy taking inventories, report that they are far enough along to realize that the total business for the year will probably be in advance of what they anticipated. Several machine tool builders, who are in close touch with the officials of the leading railroads, are of the opinion that the railroads will be large purchasers next year. The freight advances asked for are almost universally endorsed by the larger local shippers. Second-hand machinery is moving slowly, and a let-up in the demand for small electrical equipment is reported.

It is reported that the plans for the new generating plant of the Union Gas & Electric Company, Cincinnati, have been approved by the board of directors, and that bids for the necessary equipment will be called for at an early date. This project was mentioned some time ago as being under way.

The Ford Motor Car Company, Detroit, Mich., has definitely decided to build a large assembling plant in Cincinnati. A site has been secured on Ridgeway avenue, but no building plans have yet been prepared.

The University of Cincinnati will soon be ready for bids on a chemistry building, to cost approximately $200,000. Tietig & Lee, architects, are preparing the plans. No equipment details are yet available.

The Ficks-Reed Company, Cincinnati, has tentative plans under way for the erection of a large factory building on Findlay street. The company manufactures special furniture and if its plans are carried out will require a large lot of woodworking and other equipment.

McWilliams & Schulte, Cincinnati, contemplate an addition to their box factory on Court street. Woodworking equipment will be required.

The Dyno Mfg. Company, Cincinnati, has been incorporated with $10,000 capital stock to manufacture a boiler scale remover and dynamo cleanser. No equipment will be required. Joseph J. Rober is one of the principal incorporators.

The French Brothers-Bauer Company, Cincinnati, whose plans for building a number of refrigerating plants in this vicinity have previously been announced, now expects to construct a large plant at Plum and Canal streets. No definite information is available as to the equipment that will be required.

The Cincinnati Ice Mfg. Company, Cincinnati, has had plans prepared for a large addition to its Court street plant. Refrigerating equipment to increase its capacity over 60 tons a day will be required.

The American Pad & Textile Company, Chillicothe, Ohio, has decided to build a branch factory at Greenfield, Ohio.

F. R. Fribley, Bourbon, Ind., will require some equipment for an automobile repair shop and garage which he intends to erect.

Considerable electrical equipment will be bought by the municipality of Celina, Ohio. Bids will be opened December 16 by the Board of Public Affairs. One 170-kva. generator is included in the list of requirements.

Wheeling

WHEELING, W. VA., December 8, 1913.

Aside from the erection of a large power house at Bluestone Junction, W. Va., to supply power for the electrification of the Norfolk & Western Railway between Bluefield and East Vivian it is understood the officials are contemplating erecting a combined motor repair shop and car barn.

The Bengal Coal Company, Huntington, W. Va., has been incorporated with $100,000 capital stock by E. P. Hopkins, William H. Cunningham, T. F. Bailey, Jr., Frank Enslow, of Huntington, W. Va.

The Bridgeport Auto Company will begin construction of a plant near Bridgeport, Ohio, within a short time for the manufacture of automobiles, motorboats, engines and parts of machines. A large Eastern automobile company will move its plant and consolidate with the Bridgeport company. J. Bernard Handlan, of Wheeling, W. Va., is president.

Ground has been broken at Bluefield, W. Va., for the erection of a brick garage for D. G. Lilly, to be 42 x 85 ft., three stories. The first and second floors will be occupied by the Appalachian Garage Company, which will equip a repair shop.

The managers of the Ohio Tool Company, Charleston, W. Va., hope to begin the manufacture of tools in their new plant in January. Machinery from the dismantled factories at Columbus, Ohio, and Auburn, N. Y., is being installed in the Charleston plant.

An electric power plant is to be constructed at Logan, W. Va., by the Ohio Valley Company, controlled by capitalists of Toledo, Ohio, New York and London. The company plans to lay power lines over the entire Logan coalfields with lines also extending up and down Guyan River, Main Island Creek, Buffalo and Dingess Run, according to the announcement made by the manager of the company, Godfrey M. S. Tate, of Logan, W. Va. The plant will be of 30,000 kw., composed of turbine units of 500 kw. each.

The Koehnline Ice & Storage Company, Bellaire, Ohio, has been incorporated with $150,000 capital stock by James P. McCammon and G. W. Knarr, of Wheeling, Fred Wassman, of Bellaire, and others. A plant with a capacity of 50 to 100 tons daily will be built.

The Roberts Gasoline Engine & Car Company, Morgantown, W. Va., is reported to be in the market for foundry equipment. It will establish a plant for the manufacture of gasoline engines.

The Central South

LOUISVILLE, KY., December 8, 1913.

The general sentiment among the machinery men the past week has not been at all cheerful. The boiler manufacturers, who have been complaining of cut prices as the chief source of their troubles, now declare that there is no business to cut prices on; a sequel which is a little worse than the former condition. Electrical equipment firms, who have been doing a fair business, report that prospects are less numerous. Affected by conditions in the material markets, machinery buyers appear to be playing a waiting game, and not much new business is expected until after the first of the new year. Woodworking machinery manufacturers report that the Forest Products Exposition, which will be held in Chicago April 30 to May 9, 1914, and in New York May 21 to 30, will be featured by a big display of woodworking equipment, showing the great strides which have been made in this department of machinery manufacture in recent years. Manufacturers of gasoline engines report a good demand for this type of equipment from small industries in rural centers, sawmills, flour mills and similar plants taking a considerable portion of their output.

The Ford Motor Car Company, Detroit, Mich., will establish an assembling plant in Louisville for use as a Southern distributing station. The company has purchased a site at Third street and the Louisville & Nashville Railroad crossing, and will erect a plant costing $200,000, according to reports here. Work on the construction of buildings will be started in the near future. The company is erecting branches of this kind in various parts of the country.

The Voss Mantel Company, Louisville, has decided on plans for the construction of an addition to its machine room. It has placed orders for most of the woodworking machinery to be used, the American Woodworking Machinery Company and J. A. Fay & Egan obtaining the business. No additional power equipment will be needed. Louis C. Voss is the general manager.

The Helical Shock Absorber Company has been organized in Louisville with $120,000 capital stock for the manufacture of an automobile specialty. T. D. Duncan is president; A. V. Thompson vice-president and George L. Kannapell secretary. It has not been decided whether the company will establish a factory or have the absorber made by contract.

G. F. Moors, Owensboro, Ky., has patented a rotary engine and is having it made for the present at the plant of the Kentucky Electrical Company, Owensboro. A factory may be established later on.

P. H. Vaughn and J. L. Martin, Horse Cave, Ky., are planning the establishment of an electric light plant. A building has been secured and machinery will be installed in the near future.

The Eastern Kentucky Coal Company, Hazard, Ky., has been incorporated with $250,000 capital stock, and will develop 40,000 acres of coal and timber land in Perry County, Ky. F. R. Johnson, W. H. Spiney, St. Louis, Mo.; H. C. Asherby, Kirkwood, Mo., and others are interested. A large coal mining plant will first be installed.

Arthur M. Morgan, Chicago, has been selected by the City Council of Carlisle, Ky., to draft plans for the waterworks system to be installed there. The plant will cost $30,000, bonds to this amount having been voted.

The Broadhead-Garrett Lumber Company, Winchester, Ky., has purchased a large tract of hardwood timber in Perry County, Ky., and will install a sawmill on the property for development purposes.

The Stanford Water, Light & Ice Company, Stanford, Ky., will purchase two boilers with a capacity of 200 hp., as well as a pump and other auxiliary equipment.

The Manchester Mining & Mfg. Company, Barbourville, Ky., financed by J. N. Secrest & Co., Buffalo, N. Y., has been incorporated with $1,500,000 capital stock and plans to equip and develop 40,000 acres of coal land.

The Sebree Coal Mining Company, Sebree, Ky., is reported to have plans for the extensive remodeling of its power plant, etc.

The city of Whitesburg, Ky., has sold an electric light franchise to Robert Blair. The city court in charge is presided over by John Wakefield.

Paris, Ky., will install a pump of 2,500,000 gal. capacity.

The Athens Pottery Company, Athens, Tenn., will increase its capital stock from $25,000 to $35,000 with a view to enlarging the capacity of its plant.

The Kingsport Brick Corporation, Kingsport, Tenn., has plans for doubling the capacity of its plant, and will install additional machinery in the immediate future. J. Fred Johnson, Johnson City, Tenn., is president of the company.

The Clinchfield Portland Cement Corporation, which is operating a large plant at Kingsport, Tenn., is reported to have plans for increasing its capacity from 2000 to 3000 bbls. a day. Details of the improvements have not yet been decided upon.

Will H. Fox, Graysville, Tenn., is planning the establishment of a canning factory, and is in the market for special and power machinery.

The John G. Duncan Company, of Knoxville, Tenn., machinery manufacturer, is in the market for two engine lathes, used equipment preferred. The company will furnish specifications on request.

The Thacher Medicine Company, Chattanooga, Tenn., is preparing plans for a large plant, including drug mills, laboratory apparatus and other equipment, to be located on a new three-acre site. It will also install a large printing plant.

The Enterprise Ice & Coal Company, Harriman, Tenn., will install a 50-ton refrigerating machine and 30-ton freezing and distilling systems.

A 50-ton refrigerating and 25-ton freezing and distilling plant willl be equipped at Rockwood, Tenn., by the Coca Cola Bottling Works.

The Sip Bottling Company, Memphis, Tenn., is reported to have plans for the equipment of about 100 bottling plants in Mississippi, Tennessee, Arkansas and Louisiana, all under the general management of the Memphis office.

The Stovall Broom Works, Stovall, N. C., is in the market for a 50-hp. center-crank engine and a 70-hp. boiler. Either new or second-hand equipment will be considered.

The Richardson Lumber Company, Russellville, Ala., will establish a sawmill for the manufacture of cedar poles.

J. G. Beasley, Auburn, Ala., is in the market for ma-

chinery to be used in the manufacture of brooms. Power equipment will be required as well as special machinery.

Bids will be received until December 29 by A. Greenhut, mayor, Pensacola, Fla., for an air compressor.

St. Louis

ST. LOUIS, MO., December 8, 1913.

Since the beginning of this month machine tool business has shown a decided falling off. Inquiries which are coming in are reported fewer than for some years, and there are no reports coming out of plans which would indicate an immediate change in the situation. In connection with the present state of affairs, however, the reports on collections are for the most part good, showing that necessary money is available and indicating that the slackening in the demand for new equipment is largely due to conservatism, rather than to any specific cause. In addition to this, reports from various industries show that they are busier in the St. Louis territory, perhaps, than in most other sections of the country, consumption of products keeping up very well. Under these circumstances the feeling is that the conditions generally are healthy, that there are no sore spots and that capital is only waiting for definite settlement of some of the pending problems.

The Best-Clymer Mfg. Company, St. Louis, has begun the construction of a $100,000 preserving plant and will shortly be in position to place its equipment. Milton R. Clymer is president.

The St. Louis Oxygen Company, St. Louis, has been incorporated with a capital stock of $60,000 by Charles E. Mack, Eugene B. Dyer, E. S. Hart and A. H. Wittee, and plans to equip a plant for the manufacture of oxygen, hydrogen, etc.

The Moon Bros. Carriage Company, St. Louis, has increased its capital stock from $200,000 to $400,000 for the purpose of adding equipment and extending its operations.

The Southwestern Milling Company, Kansas City, Mo., whose plant was burned on December 10, has let the contract for a new mill building and improvements at a cost approximating $350,000.

The Pittsburg Elevator Company, Pittsburg, Mo., announces that it will rebuild and re-equip the elevator recently reported burned.

A cooperage plant will be established at Joplin, Mo., by the Bentonville Cooperage Company, Bentonville, Ark., which has acquired a $19,000 building.

The Republic Milling Company, Belleville, Ill., has been incorporated with a capital stock of $100,000 by M. W. Vorheis, Fred Klein, Arnold Thurnan and Charles J. Reed, and will equip a plant at Twentieth street and St. Louis avenue, East St. Louis, Ill.

The Van Buren Water Company, Van Buren, Ark., has formally decided upon the expenditure of $70,000 for the improvement of its equipment.

The Arkadelphia Water & Electric Company, Arkadelphia, Ark., has been purchased by outside capitalists who will spend $15,000 in additional equipment.

The Batesville Excelsior Company, Batesville, Ark., has determined upon the replacement of its plant at that point recently destroyed by fire.

Vernon L. Jackson and J. J. Daniel have completed plans for the establishment of a factory at Little Rock, Ark., to manufacture rubber goods.

Giles Lucas, A. W. Meier and others will equip a large creamery at Van Buren, Ark.

The Benton Cabinet Works, Benton, Ark., recently incorporated by N. D. Couch, J. E. McEwen and others, will manufacture furniture, and is reported in the market for the necessary equipment.

The McDonough-Thoits Company, recently incorporated at Hot Springs, Ark., with a capital stock of $20,000, will equip a stave mill. A. T. Thoits is president.

The Putnam Veneer & Lumber Company is reported to have plans for the establishment of a mill at Little Rock, Ark. H. I. Cutsinger, of Indianapolis, Ind., is general manager.

The Nassau Refining Company, Dewey, Okla., has been incorporated with a capital stock of $60,000 by L. R. Timmins of Dewey, G. B. Shaw of Chicago and W. D. Leeper of New York, and will establish a refinery at Dewey.

The No-Duston Corporation, Muskogee, Okla., has been incorporated with a capital stock of $50,000 and will install equipment for the manufacture of mops and sweeping compounds. W. O. McDaniel, Muskogee, is in charge.

Alexander H. Kerr & Co., Chicago, Ill., who have factories at Altoona, Kan., and Portland, Ore., are building a large new plant at Sand Springs, Okla., for the manufacture of glass jars and will soon order equipment.

W. E. Blackwell, superintendent of the municipal electric light plant at Afton, Okla., is reported in the market for a motor-driven air compressor.

A waterworks plant is to be built at Leedey, Okla., under the direction of the mayor, who is seeking equipment, it is reported.

The city of Elk City, Okla., is reported in the market for drilling equipment, dynamos, motors, etc., for an addition to its present waterworks equipment.

The Aberdeen Lumber Company, Aberdeen, Miss., is in the market for a fast-feed planer and matcher, used equipment preferred. It will also purchase a self-feed ripsaw and exhaust fan.

The cotton gin of H. T. Warlock at Lamkin, Miss., has been burned with a loss on equipment of $22,000. It is reported that it will be replaced.

R. E. Wendham's gin at Hazlehurst, Miss., is reported burned with a loss of $10,000. Equipment costing about $5000, it is stated, will be re-installed.

The city of Tutwiler, Miss., has authorized the construction of a waterworks plant to cost about $13,500.

The Louisiana State Canneries Association of Hammond, La., has plans for the equipment of a cannery at Hammond. H. F. Ehrman of Lake Charles is in charge.

The Great Southern Lumber Company, Bogalusa, La., will increase the capacity of its plant to a large extent, and is now making preparations for the erection of an addition to its mill.

The Burton-Swartz Cypress Company of Burton, La., plans the establishment of a steel and concrete band mill at Jacksonville, La. It has a capitalization of $1,200,000. W. L. Burton is president and E. G. Swartz, vice-president and treasurer.

Bids will be received by G. C. Earl, general superintendent, New Orleans, La., until January 6, for one centrifugal and eleven screw pumps, gates, etc.

The Weaver Heating, Power & Process Company, Houston, Texas, has been incorporated with $100,000 capital stock to furnish heat and power by H. F. Weaver, H. R. Bartlett, George Mammon, G. W. Hindman, Henry Rodridge and others.

The Indiana Silo Company of Texas has begun the erection of its plant at Fort Worth, which will cost approximately $15,000. The new building will be 150 x 300 ft., with a capacity of 1000 silos annually.

Mineola, Texas, has voted a $25,000 bond issue for a waterworks system.

Rockdale, Texas, has voted a $27,000 issue of bonds for waterworks.

The Pacific Coast

SAN FRANCISCO, CAL., December 5, 1913.

Business in machine tools and most lines of general equipment is extremely dull. New inquiries are almost entirely lacking, about the most important being a small list from the Southern Pacific Railroad, including a turret lathe, wheel lathe, etc. Large buyers are as usual reluctant to enter the market at this time of year, and some curtailment is noted in the small trade. The demand for woodworking and sawmill machinery is limited almost entirely to repairs and minor replacements. There is a little more interest in road-building equipment, and a very fair business for delivery next year is being booked in traction engines and heavy implements. Local merchants express a very hopeful attitude as to next year, but the outlook is uncertain, depending largely on financial conditions and political developments. Manufacturers are inclined to await the developments of the next few months, and most plans for expansion are held in abeyance. Crop conditions, however, are exceptionally good, and prospects for public improvements are better than for several months. From the large sales of automobiles and gas engines, an early renewal of activity in the small garage trade is fairly assured. Another favorable factor is improvement work outlined by various oil interests, the Standard Oil Company planning increased storage capacity in the oil fields, and large improvements at its Richmond and Los Angeles plants, while the Dutch-Shell Company is figuring on a number of new tanks, and new financial support has been found for other California oil companies.

D. W. Dodge, associate manager of the Pacific coast office of the Orenstein-Arthur Koppel Company, has just returned from Europe and states that investigations are under way with a view to importing German

lines of machinery, etc., which have not formerly been handled in this market.

The city of Oakland is taking bids for a deep-well pumping plant.

Several marine engines have lately been ordered by local fishing companies. The Union Gas Engine Company is installing a 100-hp. engine for A. Paladini, and the United Engineering Works is building two 165-hp. steam engines for the Borzone Fish Company. Some business is expected shortly from the Alaska salmon packers, though sales of fish canning equipment may be less than last year. Efforts are being made to interest the Alaska packers in machinery for the utilization of fish offal, but so far with little success.

The American Marble & Mosaic Company, San Francisco, has secured a six-acre site in South San Francisco and is planning to put in a large marble works.

It is reported that the shipbuilding plant of D. J. Hanlon is to be moved from Alameda to Oakland.

A large rice-cleaning mill is being built at Biggs, Cal., and plans are under way for several other rice mills in northern California.

The Ukiah Brewing & Ice Company, Ukiah, Cal., is preparing to enlarge its plant, and will add new ice-making and bottling machines.

Manhattan Beach, Cal., has voted a $111,000 bond issue for a municipal water system. Frank A. Lathrop is the engineer in charge.

The Hydraulic Truck Company is preparing to build a plant at Colton, Cal.

Arrangements are being made to build an incubator factory at Visalia, Cal.

Antioch, Cal., has voted a $25,000 issue of bonds for providing automatic electric pumps in addition to the steam plant at the municipal waterworks.

The Nevada Engineering Works, Reno, Nev., has been sold by A. J. McCone to P. M. Bragg, who has machine shops at Tonopah and Goldfield. The plant manufactures mining machinery, employing about 80 men, and is said to be valued at about $100,000.

The Pacific Northwest

SEATTLE, WASH., December 5, 1913.

Large local machinery dealers report business light but a little better than at this time last month. A cheerful outlook is reported. According to a recently returned capitalist, between $1,000,000 and $1,500,000 worth of stamp mills, concentrators and other mining machinery will be purchased by the owners of 15 or 20 quartz mining properties in the Valdez and Willow Creek districts of Alaska. The stamp mills and other machinery of like character made in Seattle are reported to have been found entirely satisfactory in the far North.

The County Commissioners of King County, Seattle, recently leased to John McAtter and the Kelly Shipbuilding Company tracts 17-18 on the Duwamish Waterway, on which the two firms will establish a large boat-building plant.

J. H. Parker, of Seattle, recently purchased a mill site at Blaine, Wash., and will immediately build a twelve machine shingle mill.

The Colfax Mfg. Company, Colfax, Wash., will consolidate with the Carley Bros. Machine & Foundry Company. The plants will be improved and enlarged as soon as the consolidation is effected.

The Tacoma Millwork Supply Company, Tacoma, Wash., will build an addition to its plant at 3001 Alaska street. It is understood that some new machinery will be required.

John Andal, Bellingham, Wash., plans to build a large shingle mill on the outskirts of South Bend. Mr. Andal is interested in several mills in this section.

At a recent meeting of the legislature, an appropriation of $50,000 was set aside for the establishment of a state powder factory in the State of Washington. A committee, comprising John A. Rae and state senator Ralph Metcalf, both of Tacoma, with the chemist of the State College at Pullman, Wash., have been appointed by Governor Lister to select a location for the factory.

The machine shops of the Booth-Kelly Lumber Company, Wendling, Ore., were recently destroyed by fire with a loss of about $25,000. The shops will be rebuilt at once.

The plant of the Pacific Cooperage Company, Portland, Ore., was recently damaged to the extent of about $50,000 by fire. The buildings will be repaired at once. It is reported that a considerable amount of new machinery will be needed.

Eastern Canada

TORONTO, ONT., December 6, 1913.

Bids are being received by H. C. Hocken, mayor and chairman of the board of control, Toronto, for a 20-ton hand-operated overhead traveling crane to be installed at the main pumping station of the waterworks.

The Toronto Auto Repair & Garage Company, Ltd., Toronto, has been incorporated with a capital stock of $40,000 by W. B. Proctor, J. A. E. McDonell and others to manufacture and repair automobiles, etc.

The ratepayers of Godrich, Ont., passed a by-law to guarantee the bonds of the American Road Machinery Company for $50,000 and give it a fixed assessment for a period of 10 years. The company will make improvements and will erect a new factory costing about $90,000.

The Galt Knife Factor Company, Ltd., Galt, Ont., is erecting a 45 x 140 ft. brick and cement factory on the corner of Birch and State streets. Thomas Vair and Wardlaw Vair are the chief promoters of the company. The company will manufacture knives and other cutlery.

The United Rubber Mfg. & Reclaiming Company, Brantford, Ont., which was recently organized, has purchased a site of three and a half acres on Curtis street. R. G. Wooten, general manager, has announced that a factory, 70 x 250 ft., will be erected in the spring.

The Beach Furniture, Ltd., Cornwall, Ont., has been incorporated with a capital stock of $99,900 by Robert H. Perry, James Freeman and others to manufacture furniture.

The Century Pressed Brick & Tile Company, Ltd., Georgetown, Ont., has been incorporated with a capital stock of $250,000 by John W. Ramshaw, John R. Peacock and others.

The Globe Casket Company, Ltd., London, Ont., has been incorporated with a capital stock of $40,000 by Frederick W. Coles, Robert I. Watson and others to manufacture caskets, wagons, etc.

The Inland Pulp & Paper Company, Ltd., Thorold, Ont., has been incorporated with a capital stock of $200,000 by Gabriel H. Levy, Archibald H. Gibson and others.

The Canadian Contracting Company, Ltd., Ottawa, Ont., has been incorporated with a capital stock of $1,000,000 by E. Belleau, N. Belleau and others to construct bridges, waterworks, etc.

J. P. Dupuis, Ltd., Verdun, Que., has been incorporated with a capital stock of $300,000 by Joseph P. Dupuis, George N. Monty and others to manufacture doors, sashes, etc.

Westmount Motors, Ltd., Westmount, Que., has been incorporated with a capital stock of $50,000 by William K. McKeown, Leopold Choquette and others to manufacture automobiles, bicycles, motors, etc.

The National Drop Forge Company, Ltd., Levis, Que., has been incorporated with a capital stock of $49,000 by John B. Dorais, E. Belleau and others to engage in drop forging work and to manufacture saws, etc.

Gadbois, Ltd., Montreal, has been incorporated with a capital stock of $45,000 by J. P. Gadbois, Joseph Boule and others to manufacture automobiles, etc.

The Economical Gas, Light & Power Company, Montreal, has been incorporated with a capital stock of $1,000,000 by L. Hoz, L. Chalvin and others.

Western Canada

WINNIPEG, MAN., December 5, 1913.

The industrial situation is rather quiet and the volume of machinery business is comparatively small. Reports from leading houses indicate that the year-end inventories are likely to show this year's business a little smaller than the volume of 1912. The outlook is favorable, however. The financial situation is gradually improving.

The Manitoba Cold Storage Company, Ltd., Winnipeg, has applied for power to increase its capital stock from $500,000 to $1,000,000. The company plans to increase the capacity of the plant.

A report from Calgary, Alberta, says that the Lake of the Woods Milling Company, Ltd., Montreal and Winnipeg, will erect next spring a large flour mill, grain elevator and warehouse at Calgary. W. A. Matheson is general manager of the company.

The Burgesses of Medicine Hat, Alberta, have passed by-laws which authorize the expenditure of

$175,000 on improvements and extensions to the waterworks system and $150,000 on additions to the electric light and power plant.

Christie Bros., Calgary, Alberta, will erect a large steam laundry at Saskatoon, Sask.

The Royal Crown Soaps, Ltd., will erect a plant at North Burnaby, B. C., at a cost of $250,000.

A. F. Yarrow, the famous shipbuilder of Glasgow, Scotland, and his son Norman A. Yarrow, will locate a shipbuilding plant in British Columbia.

The Ceramics, Ltd., will build a factory on a site of 220 acres which it has acquired near Sandstone, Alberta. Face brick, hollow ware, vitrified clay products, etc., will be manufactured. Natural gas from a well on the site will be utilized for power purposes, and a model town for the housing of the employees will be built near the plant. John Steinbrecher is president; R. A. Brocklebank, vice-president, and Alfred J. Bartle, secretary-treasurer.

Government Purchases

WASHINGTON, D. C., December 4, 1913.

Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, schedule 6109, until December 16, for three hydraulic presses, hydraulic pump and cutting shears for Charleston.

Until January 6, schedule 6102, for a motor-driven pump for Mare Island; schedule 6105, for a single steam hammer for Puget Sound; schedule 6126, for a horizontal boring and milling machine for Washington.

Until January 27, schedule 6107, for marine water-tube boilers for Brooklyn.

Bids will be received at the Engineer Depot, United States Army, Washington Barracks, D. C., until December 15, for furnishing 14 ventilating blowers connected to 110-volt a. c. single-phase motors, right-hand; two ventilating blowers connected to 110-volt d. c. motors, left-hand; two 18-in. disc or propeller fans, direct connected to 110-volt a. c. single-phase motors, complete, with starter; four 18-in. discs or propeller fans, direct connected to 110-volt d. c. motors, complete, with inclosed starting rheostat and main switch (ready to run sets). Further information may be had upon application to Joseph E. Kuhn, lieutenant colonel, corps of engineers, United States Army.

Bids were received at the Bureau of Supplies and Accounts, Navy Department, Washington, December 2, for furnishing supplies for the navy yards as follows:

Schedule 5992—Ordnance.

Class 121, Mare Island—One arbor press—Bid 94, $174; 171, $162; 210, $175 and $325; 263, $198.90.

Class 121, Alternate—F. o. b. works—Bid 94, $124; 171, $125; 210, $140 and $275; 263, $164.90.

Class 122, Mare Island—One universal milling machine—Bid 42, $1706.25 and $1650.17; 94, $1721; 127, $1825; 171, $1859, $1880 and $1911; 192, $1918; 219, $1979.

Class 122, Alternate—F. o. b. works—Bid 42, $1618 and $1567.75; 94, $1641; 127, $1733; 171, $1784, $1805 and $1836; 192, $1748; 202, $1668; 219, $1894.

Class 123, Mare Island—One toolmakers' engine lathe—Bid 171, $1148, $1324 and $1297; 206, $1283; 210, $1090.

Class 123, Alternate—F. o. b. works—Bid 171, $1104, $1280 and $1253; 206, $1211; 210, $1050.

Class 124, Mare Island—One sensitive bench drill—Bid 29, $92; 127, $80.60; 151, $95 and $75.70; 171, $113; 210, $96; 285, $86.

Class 124, Alternate—F. o. b. works—Bid 29, $89.50; 72, $113.50; 127, $78; 151, $90 and $72; 171, $105; 210, $90.

Class 125, Mare Island—One motor-driven bench buffing lathe—Bid 127, $72; 151, $83.40; 171, $87; 210, $75.

Class 125, Alternate—F. o. b. works—Bid 72, $87; 127, $70; 151, $80; 171, $80; 210, $72.

Class 126, Mare Island—One bench grinder—Bid 29, $82; 127, $75; 151, $64.20; 171, $59; 210, $75.

Class 126, Alternate—F. o. b. works—Bid 29, $79; 72, $59.50; 127, $73; 151, $61.20; 171, $55; 210, $70.

Schedule 5996—Steam Engineering.

Class 142, Mare Island—One circulating pump—Bid 33, $827.20; 81, $895; 178, $699.15; 278, $984.

Class 142, Alternate—F. o. b. works—Bid 33, $803.20; 75, $970.50; 77, $483.45; 81, $830; 178, $639.15; 278, $924.

Class 143, Mare Island—One air pump, with spares—Bid 33, $355.20; 75, $705.75; 81, $522.50; 278, $657.

Class 143, Alternate—F. o. b. works—Bid 33, $335.20; 81, $497.50; 278, $627.

Class 144, Mare Island—One steam-driven car compressor—Bid 24, $1650; 29, $2394 and $2144; 33, $2060; 44, $2148; 138, $2133; 171, $2080 and $2390; 263, $1948.

Class 144, Alternate—F. o. b. works—Bid 29, $2050 and $1850; 33, $1679; 65, $1588; 138, $1666; 171, $1750 and $2100; 263, $1649.50.

Class 145, Mare Island—Four air receivers steel—Bid 29, $68.75; 33, $52; 44, $63.50; 65, $49; 138, $57.50; 151, $57; 171, $62 and $52; 263, $62.48.

Class 145, Alternate—F. o. b. works—Bid 29, $57.75; 33, $42; 98, $39; 138, $36; 151, $45; 263, $49.70.

The names of bidders and the numbers under which they are designated in the above list are as follows:

24. Blaisdell Machinery Company. 29. Berger & Carter Company. 33. Blake & Knowles Steam Pump Works. 42. Brown & Sharpe Mfg. Company. 44. Bury Compressor Company. 65. Chicago Pneumatic Tool Company. 72. James Clarke, Jr., Electric Company. 75. A. S. Cameron Steam Pump Works. 77. Dean Bros. Steam Pump Works. 81. M. T. Davidson & Co. 94. Eccles & Smith Mfg. Company. 98. S. Freeman & Sons Mfg. Company. 127. Harron, Rickard & McCone. 138. Ingersoll-Rand Company. 151. Kemp Machinery Company. 171. Manning, Maxwell & Moore. 178. Henry May. 192. Niles-Bement-Pond Company. 202. Osterlain Machine Company. 206. Pratt & Whitney Company. 210. Pacific Tool & Supply Company. 219. Ricks Compound Air & Drill Company. 263. Universal Trading Company. 278. Warren Steam Pump Company. 285. Willey Machine Company.

The following bids were received December 19 at the United States Reclamation Service, Elephant Butte, N. M., for furnishing four balanced valves and accessories for the Elephant Butte Dam, Rio Grande project, New Mexico-Texas:

Bid 1. Pittsburgh Valve Foundry & Mfg. Company.
2. Hinman Hydraulic & Mfg. Company, Denver, Colo.
3. Rosedale Foundry & Machinery Company.
4. Best Mfg. Company.
5. Power & Mining Machinery Company.
6. Florence Iron Works.
7. Providence Engineering Works.
8. Coffin Valve Company.
9. Minneapolis Steel & Machinery Company.
10. Fulton Engine Works.

Item 1. Four balanced valves, complete, with different parts—Bid 1, $26,700; 2, $27,990; 3, $27,850; 4, $24,980; 5, $28,152; 6, $30,764; 7, $32,540; 8, $25,872; 9, $35,000; 10, $40,795.

Note 3, in case the plug rings and seat rings are to be made of monel metal instead of manganese bronze—Bid 1, add $3100; 2, add $1360; 3, add $1650; 4, add $2470; 5, $1707; 6, $1100; 7, add $1200; 8, add $1461; 9, no change; 10, add $2368.

Note 4, in case the plugs and plug housings are made of semi-steel instead of cast iron, add—Bid 1, $240; 2, nothing; 3, $600; 4, $755; 5, no extra charge for semi-steel up to 20 per cent. of steel in melt; 6, none; 7, $400; 8, $297.50; 9, none; 10, $1784.

Item 1, note 3—Bid 1, $29,800; 2, $29,350; 3, $29,500; 4, $27,450; 5, $29,859; 6, $31,864; 7, $33,740; 8, $27,333; 9, $35,000; 10, $43,163.

Item 1, note 4—Bid 1, $26,940; 2, $27,990; 3, $28,450; 4, $25,735; 5, $28,152; 6, $30,764; 7, $32,940; 8, $26,169.50; 9, $35,000; 10, $42,579.

Item 1, notes 3 and 4—Bid 1, $30,040; 2, $29,350; 3, $30,100; 4, $28,205; 5, $29,859; 6, $31,864; 7, $34,140; 8, $27,630.50; 9, $35,000; 10, $44,947.

Shipping weight—Bid 1, 348,000 lb.; 2, 288,200 lb. and 56,800 lb.; 3, 370,000 lb.; 4, 364,000 lb.; 5, 355,000 lb.; 6, 350,000 lb.; 7, 375,000 lb.; 8, 364,800 lb.; 9, 343,000 lb.; 10, 374,000 lb.

Shipping Point—Bid 1, Pittsburgh, Pa.; 2, Denver, Colo., and Chicago, Ill.; 3, Pittsburgh, Pa.; 4, Pittsburgh, Pa.; 5, Cudahy, Wis.; 6, Camden, N. J.; 7, Providence, R. I.; 8, Neponset, Mass.; 9, not given; 10, Los Angeles, Cal.

Item 1, plus freight—Bid 1, $29,358; 2, $29,543; 3, $30,676; 4, $27,760; 5, $30,530; 6, $33,196; 7, $35,146; 8, $28,407; 9, $37,298; 10, $42,983.

The following bids were received December 19 at the office of the United States Reclamation Service, Elephant Butte, N. M., for furnishing four service gates and accessories for the Elephant Butte Dam., N. M.:

Bid 1, Pittsburgh Valve Foundry & Construction Company; 2, Hinman Hydraulic Mfg. Company; 3, Rosedale Foundry & Machine Company; 4, Wheeling Mold & Foundry Company; 5, Power & Mining Machinery Company; 6, Llewellyn Iron Works; 7, Providence Engineering Works; 8, Coffin Valve Company; 9, Fulton Engine Works.

Item 1. Four service gates, etc.—Bid 1, $26,000; 2, $25,230; 3, $27,290; 4, $29,200; 5, $30,058; 6, $41,790; 7, $34,080; 8, $23,000; 9, $43,500.

Item 2. One pawl stand and mechanism—Bid 1, $59; 2, $125; 3, $240; 4, $200; 5, $247; 6, $150; 7, $200; 8, $230; 9, $175.

Item 3. Special wrenches—Bid 1, $13; 2, $12; 3, $18; 4, $20; 5, $33; 6, $25; 7, $70; 8, $18; 9, $18.

Total—Bid 1, $26,072; 2, $25,367; 3, $27,548; 4, $29,420; 5, $30,338; 6, $41,965; 7, $34,350; 8, $23,248; 9, $43,693.

Shipping weight—Bid 1, 397,000 lb.; 2, 390,000 lb.; 3, 430,000 lb.; 4, 397,400 lb.; 5, 396,000 lb.; 6, 440,000 lb.; 7, 418,000 lb.; 8, 422,000 lb.; 9, 413,000 lb.

Shipping point—Bid 1, Pittsburgh, Pa.; 2, Denver, Colo.; 3, Pittsburgh, Pa.; 4, Wheeling, W. Va.; 5, Cudahy, Wis.; 6, from own shops at Los Angeles or certain special items from other firms; 7, Providence, R. I.; 8, not stated; 9, Los Angeles, Cal.

Total, plus freight—Bid 1, $29,105; 2, $26,967; 3, $30,833; 4, $32,456; 5, $32,991; 6, $44,539; 7, $37,255; 8, $26,181; 9, $46,109.

Abstract of bids for needle regulating valves for Minitare Dam, North Platte project, Neb., received under advertisement No. 248 (Washington number), opened at Los Angeles, Cal., on October 19:

Pittsburgh Valve Foundry & Construction Company, $4528; at Pittsburgh, Pa., 105 days; weight 61,000 lb.

Coffin Valve Company, $4755; at Neponset, Mass., 162 days; weight 55,700 lb.

Hinman Hydraulic Mfg. Company, $5173; at Denver, Colo., 50 days; weight 57,800 lb.

Best Mfg. Company, $5240; at Verona, Pa., 2 in 75 days and 2 in 95 days; weight 74,000 lb.

Power & Mining Machinery Company, $5261; at Cudahy, Wis., 100 days; weight 57,000 lb.

Rosedale Foundry & Machine Company, $5420; at Pittsburgh, Pa., 120 days; weight 62,000 lb.

Minneapolis Steel & Machinery Company, $5610.71; at Minneapolis, 65 working days; weight 62,000 lb.

Advance Machine Company, $5782.42; at Los Angeles, Cal., 90 days; weight 62,000 lb.

Pelton Water Wheel Company, $6675; at Harrisburg, Pa., 2 in 80 days and 2 in 110 days; weight 66,200 lb.

Providence Engine Works, $6990; at Providence, R. I., 150 days; weight 65,000 lb.

Fulton Engine Works, $8195; at Los Angeles, Cal., 120 days; weight 68,000 lb.

Trade Publications

Cold Rolling Mills.—Engineering Products Company, 50 Church street, New York City. Catalogue. Size, 7¼ x 10½ in.; 33 pages. Illustrates and describes cold rolling mills and auxiliary machines used in the manufacture of long strips of steel, brass, iron, copper, zinc, etc. The machines described are alike in principle and construction, differing chiefly in size and drive arrangement only. The machines for belt drive have a special bedplate surface for the reception of a motor which can be easily installed and the direct motor-driven machines can be changed to belt drive. All the machines are equipped with a spring friction coupling inserted between the drive and the machine, so that the machine can easily be engaged or disengaged by a hand lever. All but one size are built as single rolling mills, each pair of rollers with its drive is a self-contained individual machine. It is said that by this arrangement it is practically impossible for shock, resulting from the engagement or disengaging of one machine, to affect the product being rolled on another. Hardened and ground Krupp crucible steel rollers built for internal water cooling are used on all the machines although cast-iron rollers are used in some cases. The water connection is a simple box device that is easily removed and replaced. Rollers are also built to order from drawings to fit any machine already installed. A second type designed for high speed work and having unusual strength and sturdiness to allow for high working velocity without danger to the machine or to the quality of the output is also shown. Attention is also called to other machinery for cold rolling mills such as rewinding machines, circular machines, automatic pickling machines, etc., and to the guarantees which are given with the company's equipment.

Milling Machines.—Cincinnati Milling Machine Company, Cincinnati, Ohio. Catalogue. Size, 8½ x 11 in.; 128 pages. Covers an extensive line of milling machines and illustrates the complete machines as well as the different parts. This year's issue of the catalogue is entirely rearranged, illustrations showing the various types of machines in operation and data being included to give an idea of the class of work for which each type and style of machine is adapted. Examples of especially accurate work done on the company's machines are shown. A large number of attachments which can be supplied are also described, and suggested lists of tools for different machines are given. A chapter on the erection and care of milling machines is included. Mention is made of the company's cutter grinders and of a new line of semi-automatic manufacturing machines.

Chains.—Union Chain & Mfg. Company, Seville, Ohio. Booklet No. 2. Relates especially to tests made by the Ohio State University of the company's chain. It is said that the angle of the offsets in the links remained the same as before the tests, which were carried to the breaking point. A comparative table is given of the Union steel chain and corresponding sizes of standard malleable iron link belting chains. It is pointed out that the bearings in the Union company's chain are case hardened and are practically dustproof.

Safety Goggles.—Julius King Optical Company, 10 Maiden lane, New York City. Leaflet. Calls attention to the necessity and obligation of furnishing the protection afforded workmen by goggles, especially since the passage of employer compensation laws, and points the way to the adoption of the glasses by the employees after a proposed educational campaign is carried on.

Milling, Cutting and Drilling Machines and Dado Heads.—Fox Machine Company, Grand Rapids, Mich. Two catalogues, two folders and leaflet. One catalogue treats of combination hand and power feed milling machines. Special attention is called to the pilot wheel hand feed, which among other advantages claimed, is said to give a continuous cut to the full travel of the 12-in. table. Mention is also made of a combined hand and power milling machine. Its special feature is its wide utility, it being claimed ideal for light as well as for medium class work. The pipe and tube cutters illustrated in the second catalogue are furnished to cut stock up to 4½ in. outside diameter. The largest is furnished with direct motor drive if desired. The folder calls attention to multiple-spindle drilling machines and illustrates among others a 30-in. circular head 14-spindle machine for drilling valve flanges. The other folder treats of adjustable dado heads. Especially quick adjustments, safety and fast and clean cutting are claimed for the design and construction of the heads. The wood trimmers described in the folder have gauges which cannot get into the path of the knives.

Wheel Press and Sand Dryer.—Walter A. Zelnicker Supply Company, St. Louis, Mo. Circular. The wheel press illustrated is of the portable, hydraulic type and is used for pressing wheels on and off axles, armatures, flywheels, on and off shafts, etc. It is said that it is easily operated by unskilled labor. The sand dryer, furnished in 3, 5 and 10 ton sizes, is heated by coal, coke or wood. The wet sand is shoveled into a skirting surrounding a heated dome and sifts through a perforated ring.

Turbo-Undergrate Blowers.—B. F. Sturtevant Company, Hyde Park, Boston, Mass. Mailing card. Illustrates four Sturtevant 22-in. turbo-undergrate blowers supplying draft for four 300-hp. Babcock & Wilcox boilers in the New York Life Insurance Building, New York City, each blower delivering 6000 cu. ft. of air per min. at a static pressure of 1¼ in. Attention is called to the increased power obtained from old plants by the help of the blowers for the same fuel or the same power from cheaper fuel.

Electrically Driven Pumps.—United Iron Works, Oakland, Cal. Folder No. 42. Illustrates a line of direct-connected pumps of one, two, three and four step type, designed for irrigation and general pumping service. A portable outfit with gas engine drive, mounted on a commercial truck designed for contractors' use is shown. Mention is made of the ice and refrigerating machinery made by this company. Tables and rules in regard to frictional losses, duty of water and other allied subjects are given.

Taps.—Charles H. Besly & Co., 118 North Clinton street, Chicago, Ill. Stock list No. 100. Is an index to all taps which this company regularly manufactures. These include machinists' hand, machine screw and nut, stove bolt, straight and taper boiler, washout, spindle staybolt and single and double automatic tapping machine taps. All of these are illustrated and briefly described, and in addition considerable useful information about screw threads, tap drills and shanks and squares is also included.

Sheet Metal Seaming Machine.—Hemp & Co., St. Louis, Mo. Folder. Calls attention to a machine for closing the seams or grooving stove pipe, which was illustrated in *The Iron Age*, August 28, 1913. A feature of the machine is an adjustment for putting together all gauges and sizes of stove pipe, including taper joints, as well as its adaptability for closing the seams of furnace pipes and other sheet metal articles.

Coils, Bends and Water Heaters.—Whitlock Coil Pipe pany, Hartford, Conn. Two illustrated catalogues, pamphlet, folder and list of users. The first catalogue illustrates a large number of typical coils and bends made by this company. Special attention is called to the welded pipe manufactured and the Whitlock joint which has a double lap and is so designed that the thickness of the pipe is preserved and increased at the corner. It is said that this joint is given a square finish on the inside, eliminating the pocket usually present. A list is given of prominent installations. The second catalogue deals with feed water heaters, hot water and other heaters. Among other features, all joints in the feed water heaters are brazed. Seamless drawn copper tubing is used and the water comes into contact with no other metal than copper in passing through the heater. A cross-section illustration of one installation is given. The pamphlet deals with the American hot water heater, made in live steam, exhaust steam and combination live-exhaust steam types. The folder also relates to the construction of the feed water heater.

Cranes.—Northern Engineering Works, Detroit, Mich. Catalogue No. 26. Is a condensed catalogue compiled from the different bulletins in which the various classes of cranes illustrated are described more fully. After a brief description of what is termed the standard type crane, a number of views of various styles in use are given, together with a number of views of the motors and trolleys. The cranes illustrated include single and double girder hand and power traveling, mill, traveling transfer, ladle, car handling, jib, bridge and grab bucket cranes.

Bolts.—Clark Bros. Bolt Company, Milldale, Conn. Catalogue. Pertains to an extensive line of bolts, nuts, screws and washers and rivets, the bolts being supplied in iron, steel or brass, with sheradized, galvanized or nickel finishes. The general arrangement of the catalogue is to show one type of bolt on a page with a list of the lengths and diameters in which it can be furnished, and to facilitate the finding of any particular type a thumb index is used. A number of tables of useful information on the weight of various forms and kinds of bars, threads, pitches, decimal equivalents and a number of views of special types of bolts are included.

Duplex Power Pumps.—Gardner Governor Company, Quincy, Ill. Circular P-8. Describes the Gardner duplex power pump, which is the latest addition to the company's line of pumping machinery. In general construction, the pump is the same as the company's line of steam pumps, and can be furnished in the packed piston and outside center packed plunger types, although, if desired, some can be made of the ring and plunger pattern. Special features of the pumps are briefly mentioned, and there are a number of engravings of the different types that can be supplied. A table of sizes and capacities is also included.

Steel Lockers.—Durand Steel Locker Company, 76 West Monroe street, Chicago, Ill. Catalogue F. Illustrates a number of different types of steel lockers, both singly and installed, and contains specifications for the construction of lockers, as well as a brief description of a special multiple locking device, so that the door is secured at several points. Another feature of the locker is the use of a special type of hinge in which the metal is solid around the staple instead of being merely folded around a pin, as in the ordinary butt hinge.

Semi-Automatic Milling Machines.—Cincinnati Milling Machine Company, Oakley, Cincinnati, Ohio. Circular. Relates to 28-in. duplex, plain and face semi-automatic milling machines, especially designed for large quantity work. The feature of these machines is that they are constructed so that by using trip dogs the machines can be set to make them entirely automatic, except for the chucking of the pieces. It is also possible to rearrange the dogs and operate in the ordinary cycles and to obtain any desired cycle between this and the full automatic operation. Attention is called to the rigid construction of the machines, and when set for work there are only two movable parts. Various parts of the machine and their working, as well as entire machines, are shown. Examples of work done, employing different cycles of movement, are illustrated and described.